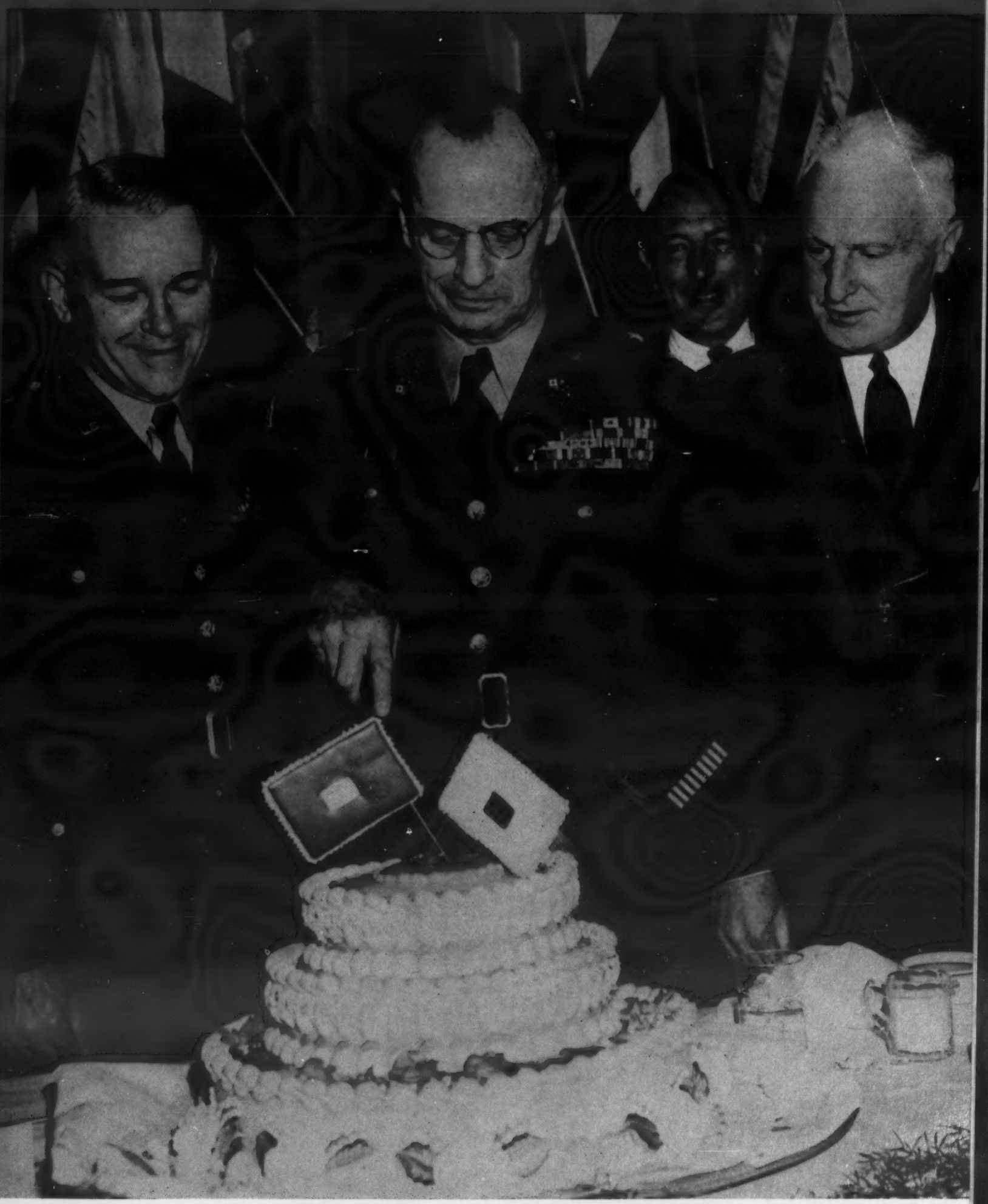
MARCH-APRIL 1951

SIGNAL



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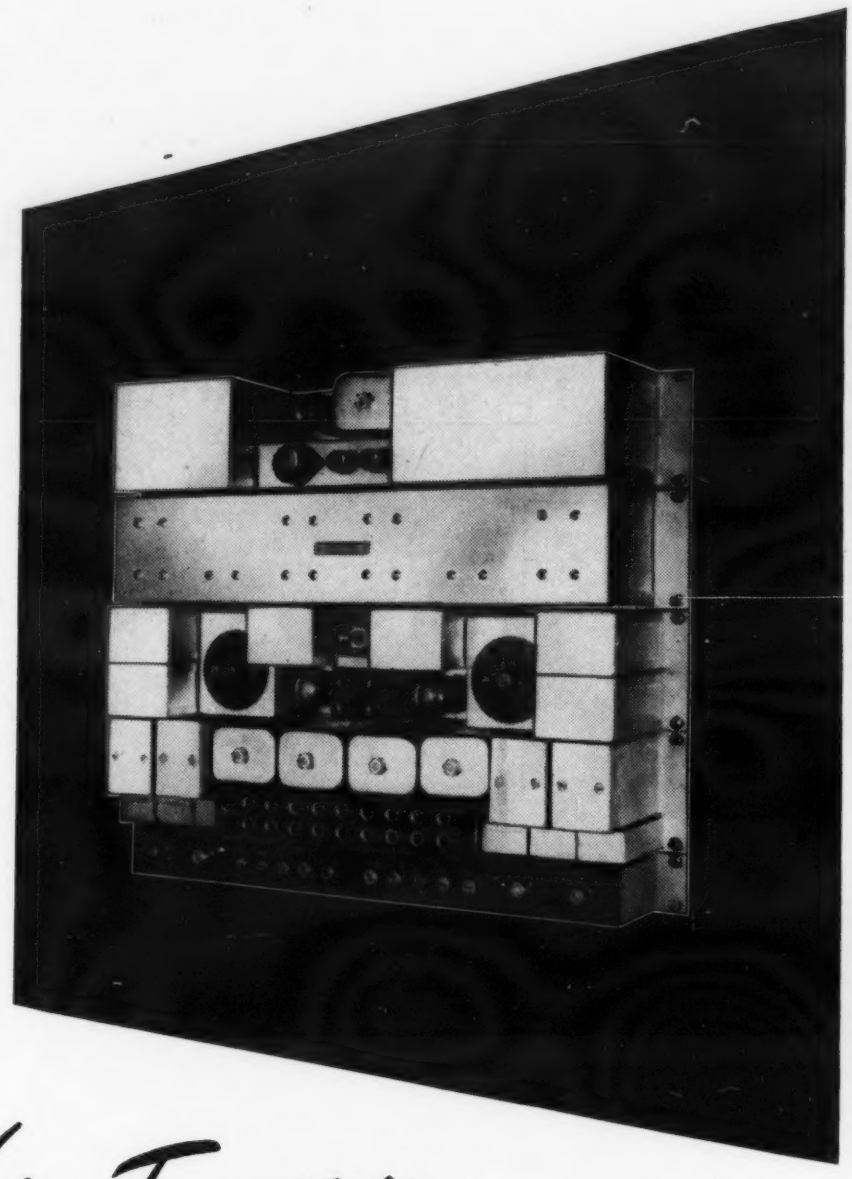

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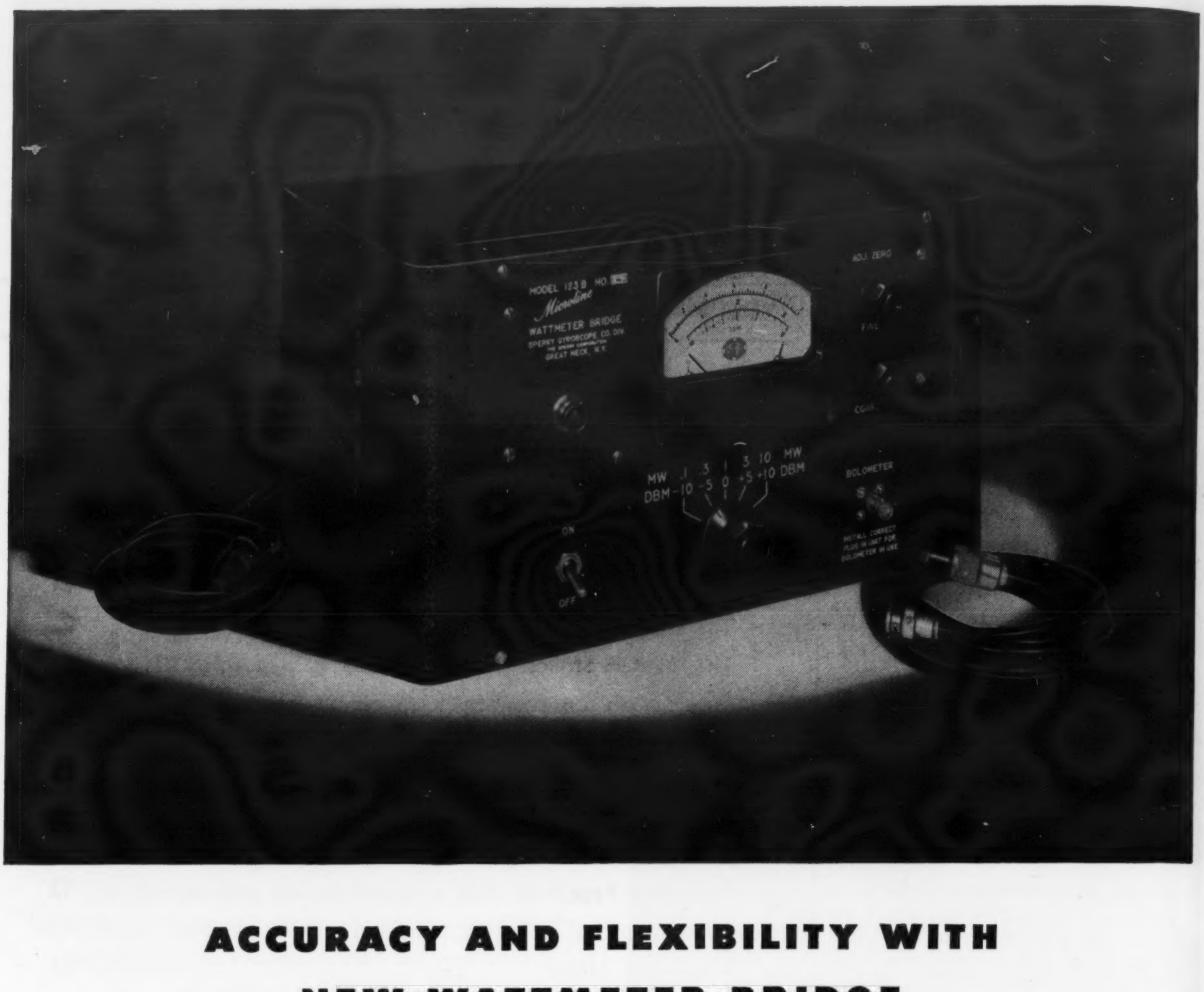
THE COVER

AFCA members and guests recently packed Washington's National Press Club auditorium to pay tribute to retiring Chief Signal Officer, Maj. Gen. Spencer B. Akin, and at the same time to commemorate the Signal Corps' 88th birthday. Our cover photo shows Gen. Akin cutting the birthday cake, with Gen. J. Lawton Collins, Army Chief of Staff, and Maj. Gen. William H. Harrison, DPA Administrator, looking on. In the background is Col. Percy Black, Washington Chapter Program Committee Chairman.



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The drop near Suchon. Lower right corner: Cpl. Totora, having landed earlier, films paratroopers and equipment coming down.

He had never made a jump before, but Army Pictorial cameraman Totora went along for a combat jump behind enemy lines in Korea with the famed 187th

Cameramen for Hell's Angels

"Ever Made A Jump?"

The paratroopers of the 187th Regimental Combat Team ("Angels from Hell") loading onto the planes at Kimpo Air Field for the first airborne operation of the war. One of them gave a last, worried look back at the rain-puddled air strip. This was going to be the first parachute jump of his life.

With no previous jump training, Signal Corps cameraman Corporal Leonardo Totora of Huntington, Long Island, had asked to go along. If everything went okay he would get some fine movie film of the 187th paratroopers landing behind North Korean lines at Sukchon. If something went wrong . . . well, he didn't like to think about that.

A dark-haired, dark-eyed young man of Italian extraction, he had wanted all his life to make a parachute jump. Then he had heard through the grapevine that the 187th was making preparations for an airborne operation. His friends and fellow cameraman, Sergeant Lester A. Marks of Providence, Rhode Island, mentioned it casually one day in Seoul. Totora, who was lying on his bunk resting between assignments, got up quickly.

"Do you think I could come along, too?" he asked.

Marks, an ex-paratrooper from World War II, looked at him. "Ever made a combat jump before?" he asked.

Totora shook his head.

Marks squinted doubtfully. *"Ever made a jump, period?"*

"No."

"'Well, I'm warning you, its going to be rough." Marks said. "For a guy who's never jumped before, I don't think you ought to try it."

"Look, I'm not kidding myself about it." Totora insisted. "Know it's going to be rough, but I'd still like to try it. Can you fix it up for me?"

Marks shrugged his shoulders. "Well, it's okay with me. But we'll have to go out and talk with the public information officer of the 187th. We'll see what he says about it."

Totora had his fingers crossed when he popped the idea to the PIO lieutenant of the 187th. The lieutenant started to shake his head.

"I don't know about this," he said. "Without any previous experience you could break a leg or something. Why don't you make a practice jump first?"

Totora thought a moment. He had two years and eleven months in the Army, most of it in the Signal Corps Photographic Center at Long Island. There he had been a member of a special detachment of photographers and cameramen which had traveled along the world-wide chain of U.S. outposts taking pictures in places like Alaska, Germany and Bermuda.

Before that he had been a still photographer in civilian life, taking shots of weddings and parties for a living. More recently he had come to Korea and joined the GHQ photographic detachment of Company "A", 71st Signal Service Battalion. He had already seen a lot of the war with the 1st Cavalry Division. Some of it had been interesting to him but most of it, the ugly part, he wanted to forget.

"I'll tell you what, sir," he said finally. "If I'm going to break a leg, I don't want to do it on a practice jump and never get a chance to get any pictures. I'd rather go into this thing cold."

When the paratroopers heard about Totora's decision, they bunched around him like a couple of big brothers coaching a younger one before his first fight.

"You know how to land right?" one of them asked. "You got to keep your legs straight and your feet together."

"Yeah, keep 'em straight but not

stiff," a second one said. "And don't look at the ground. That's the worst thing you can do when you're getting close. It makes you want to pull your legs up and that's wrong. You gotta keep them straight to take up your fall."

"And another thing," the first paratrooper said. "If you get to oscillating—"

"What's that?" Totora asked.

"That's when you start swinging back and forth under your chute. What you got to do is this—" and he held up both hands over his head. "You ever milk a cow?" Well, that's what you do with the risers, those cords running up to the chute. You milk 'em back and forth and it'll stop you from oscillating."

"Can you remember all that?" the second paratrooper asked.

"I guess so," Totora said.

The paratroopers studied him for a long moment. The the first one said, "Guess we better tell him what to do if he gets tangled with somebody else's chute. Listen, fellow, it's going to be plenty crowded up there. You won't be the only guy coming down and if you run into anybody, just don't lose your nerve. One chute is plenty for even three guys, so all you got to do is grab onto his risers and come down with him. Got it?"

Totora nodded. He was thinking of his camera. What if he didn't land right and smashed it? There wouldn't be any pictures.

"Could I ask one of you guys a favor?" he said.

"Sure."

"Well, my camera is kind of important. I might break it if I didn't land right. Even a little bump could knock the lens out of focus. Could one of you carry it for me?"

A sergeant held out his hand for the camera.

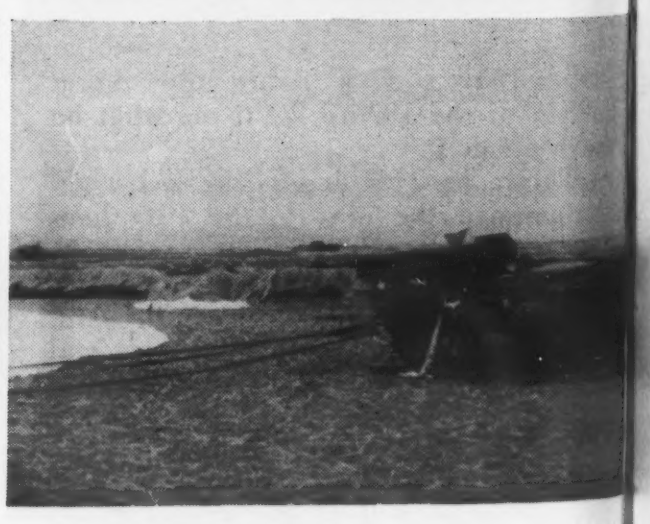
"I'll take it down for you in one of my packs," he said. "You get right behind me in the plane so we'll land close together."

A few minutes before the signal came to jump Totora suddenly felt cold all over and he wished he hadn't come.

Cpl. Leonardo Totora

He was standing there in line, the seventh man from the gaping doorway. Outside the valley with its winding river was already dotted with the chutes of the first wave of paratroopers. The drop zone stretched across the dried-up

The scenes below were photographed by Sgt. Marks and Cpl. Totora while paratroopers of the 187th Regimental Combat Team were boarding airplanes and preparing to board, and after the landing had been made near Sukchon, Korea. At the right, and center below, paratroopers cut away protective covering from vehicles and other equipment which has been dropped by parachute. Lower right, 187th troopers warily cover North Koreans approaching with arms upraised.



Marks First Cameraman to Make Jump In Korea—Wounded In Two Wars

Sergeant Lester A. Marks, with whom Corporal Totora made his novice parachute jump has been wounded in the Korean fighting since the writing of the Totora story. It was the second war in which Marks has been wounded. A paratrooper in World War II he made his first combat jump over France during the Normandy invasion, and was later wounded and captured at Bastogne.

At the time of taking Totora along on the Korean jump, Marks became the first cameraman in the Korean War to make a parachute jump. Like Totora, Marks made the jump on his own hook. Learning that a combat jump was in the making he got himself attached to the 187th Regimental Combat Team and jumped with that outfit over Sukchom last October. He hit the silk close on the heels of the commanding officer, Brigadier General (then colonel) Frank S. Bowen, jumping from the lead plane in the first wave of "flying boxcars."

Sgt. Lester A. Marks

The photographic combat shots Marks made after landing have been adjudged so excellent as to look as though they had been made under comparatively calm conditions where he would have had plenty of time to check his exposure and frame his pictures. Yet, while the expertness of the filming seemingly indicates lengthy experience, Marks had never touched a movie camera until three years ago. In fact, his only photo experience had been as an amateur making snap shots with a still camera. Returning to the Army in 1947 he had been sent to the Signal Corps Photographic School where he received all his film training. He had enlisted for the 11th Airborne Division, but his World War II wounds disqualified him for the paratroopers.

The circumstances of his being wounded in the Korean conflict should add to his decorations of World War II, in which he received both the Silver and Bronze Stars.

Filming some extremely heavy action one day with Colonel (now B. G.) Mike Michaeli's famed 27th Wolfhound Regiment, Marks saw a rifleman fall, wounded in the leg. Mortars were crumping in and the enemy's heavy artillery was beginning to get the range, but Marks kept on shooting the action as he saw a lieutenant go to the wounded man's aid. Then the lieutenant was shot. Marks stowed away his photo gear and went to their assistance. He worked the wounded rifleman to the comparative safety of a ditch, and a little later a tank crew gave him protective fire while he hauled his heavy burden over to take cover again beside the tank. A mortar crumped into their position, and as the fates would have it, the only man wounded by the blast and shrapnel was the already-wounded rifleman. Marks heaved his man up again and started for the rear where his jeep was standing. He'd gone about 20 feet when a shot ripped into his film bag and creased his skin. He had to drop the bag containing all his hard won film. Another shot ripped into his elbow, but he struggled on to the jeep, got his man aboard, and still under intense fire got the jeep underway to safety.

---

rice paddies down through the narrow gap left by the dark ragged mountains.

"Hook up!" a voice commanded and now there were only a few seconds left to sit down again if he wanted to change his mind.

But his pride held him in the line behind the sergeant who was carrying his camera for him. "These guys put their confidence in me and I can't let them down," he thought. Suddenly the sergeant was moving forward toward the door. Totora followed him.

There was a rush of air as he met the slipstream beyond the door. Then he was a free-falling body plunging down through space. Oddly, he was no longer afraid now. It was wonderful and he would have willingly done it all over again. "It was the most sensational feeling I've ever had in my life," he said afterward. "It can't be compared to anything else."

Seconds later he felt the shock of the pull-up as the parachute opened over his head. He had thought that part would hurt, but it didn't. Now he was floating down leisurely. He said afterward he felt like a king on a throne way up there.

He was descending with the second wave of troopers. Inside his pack he carried C rations, extra clothing, 1800 feet of film and some personal articles. The sky was hazy with the sun burning weakly through the overcast. He made a mental note of that, thinking he would have to shoot up at it. At a hundred feet left to drop it was like watching a car speeding toward him. His eyes kept looking downward in spite of him. "Keep your eyes off the ground and your legs straight," he kept telling himself.

At the last moment he straightened his frightened legs and made what paratroopers call a good "three point" landing. His feet struck first. Then he fell back on his buttocks and continued to roll backward until his shoulders had taken up the final shock of the drop.

In a few moments he wriggled free of his chute harness like a moth shedding its cocoon. The paratrooper sergeant with his camera was already waiting to hand it to him.

Shortly afterward he met Sergeant Marks walking across the rice paddies.

"Well, how'd you like it?" Marks asked.

"Swell," Totora said. "I'm ready to go again."

Marks laughed. He was sure he had sweated out the jump worse than Totora. "He didn't know what was coming and I did," he said afterward. "And what made it worse for me was, I hadn't jumped in six years. At the last minute I was telling myself I couldn't do it."

"Okay, we've got a job to do," Marks added and they got ready to film the main body of paratroopers, due to arrive any moment.

Marks stayed in the drop zone for the close shots and Totora pulled back for the long shots. The roar of the "flying boxcars" was already shaking the valley. Totora picked them up in the viewfinder of his camera and followed them across the sky. As they roared overhead they began to spew forth what seemed to be great, dark bubbles. These "bubbles" started as tiny specks and then burst into full size and settled slowly downward. Ant-like men and "toy" jeeps and artillery pieces dangled from them. It was a cameraman's paradise. "There was so much to photograph I could have gone on and on," he said afterward.

The only thing they missed was the actual fighting between the paratroopers and the North Koreans. It took place after dark, which, of course, meant no pictures.

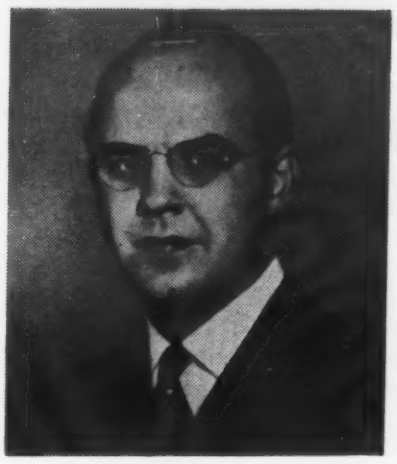
For Marks, who was assigned to the 8th Army Photo Service Company, the jump was the strange fulfillment of an old wish. Back in 1947 he had tried to enlist in the 11th Airborne Division but his World War II wounds disqualified him and he took the Signal Corps instead. Now he had won back the right to wear the parachutist badge.

For Totora it was a wild plunge into adventure that also won him the right to wear the parachutist badge. There was even a touch of ironical understatement in the official orders: ". . . having completed a course of instruction in basic airborne training (he) is rated qualified parachutist and authorized to wear the parachutist badge effective 20 October 1950."

Not long afterward the commanding general of the 187th, Brigadier General F. S. Bowen, Jr., dictated a letter to his secretary. One paragraph of his letter follows:

"During his stay with us, Corporal Totora impressed us all with his courage and professional ability. Needless to say, he is considered an honorary member of the "Angels from Hell" Regiment. Please assure him that his jump wings will be forwarded under separate cover. . ."

From the President



President Gary, in final message as AFCA president, expresses his thanks for the aid and cooperation he has received while in office, and urges all members to keep in mind the interests of AFCA in the critical period ahead.

The plans for the Annual Convention of the AFCA, to be held in Chicago on April 19, 20 and 21, have now been completed. Members of the Chicago Chapter, in whose hands has rested the responsibility for working out the manifold details of the program, have given generously of their time and effort. If the work and enthusiasm they have put into their planning represent a good yardstick of the results, as I believe they do, I am confident that you will all be pleased and proud to be on the rolls of those present at the Convention.

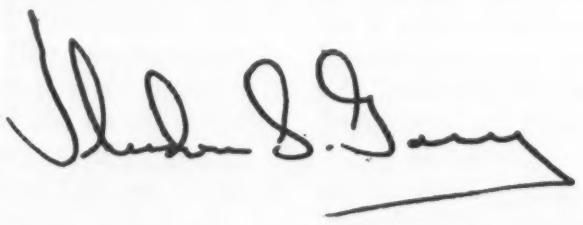
The program is given in complete detail in this issue of SIGNAL so I need not elaborate any further on it here. But I do want to urge all members, and their wives as well, to make every possible effort to be on hand. You have my assurance that the program will be informative, interesting and enjoyable.

This is the Fifth Convention of our Association. Those of you who have attended earlier conventions know that they have set exceedingly high standards. The Chicago Chapter, which is our host this year, has done nobly in measuring up to those standards.

As this is the last letter I shall address to the membership as President, I should like to take this opportunity of thanking all of you—the staff, the service personnel and our many friends—who have aided and cooperated in so many ways in carrying out the aims of the AFCA during the past year. With your help and wise counsel, the AFCA has steadily grown in scope and influence, and has materially advanced the common interests of the Armed Forces and the industries which serve them.

Great as the challenge has been during the past several months it is more than likely that the challenge of the next few years will be far greater. I therefore urge all of you to keep the interests of the AFCA firmly in mind and to maintain a keen sense of responsibility for the work in which we, whether members of the Armed Forces or representatives of industry, have such great mutual concern. We need all of the constructive and helpful suggestions that we can get from every member. I ask that each of you keep this in mind, and when you think of anything that might be helpful, drop a note to George Dixon at headquarters in Washington, or to your national President.

Thank you all again for your loyal and continuing interest. I shall look forward to seeing you at the Drake on April 19, 20 and 21.



Photos

Leading communications officials of the armed services and industry packed the National Press Club's auditorium in Washington, recently, to pay tribute to retiring Chief Signal Officer Maj. Gen. Spencer B. Akin, and at the same time to commemorate the 88th birthday of the Signal Corps. Photo at right shows Gen. Akin cutting the birthday cake. L to R: Washington Chapter President Francis H. Engel, Army Chief of Staff J. Lawton Collins, Gen. Akin, Washington Chapter program committee chairman Percy Black (in background), DPA Administrator Maj. Gen. William H. Harrison, and Under Secretary of the Army Archibald S. Alexander.

Left: Gen. Harrison addresses AFCA Washington Chapter meeting. L to R: Rear Admiral John R. Redman, Director of Naval Communications; Gen. Collins; Gen. Akin; in background, Col. Percy Black; Gen. Harrison; and far right, in shadow, W. W. Watts, AFCA vice president and director, now on leave from his position as vice president of RCA Victor for an assignment with DPA.

Left: AFCA Washington Chapter President Francis H. Engel, RCA Victor Washington chief; Maj. Gen. Kirke B. Lawton, Deputy Chief Signal Officer; Adm. Redman; Gen. Collins; Gen. Akin.

Right: Col. Percy Black, Automatic Electric vice president, and program committee chairman, Washington Chapter; Gen. Harrison; Under Secretary Alexander; and Maj. Gen. Francis L. Ankenbrandt, Air Force Director of Communications.

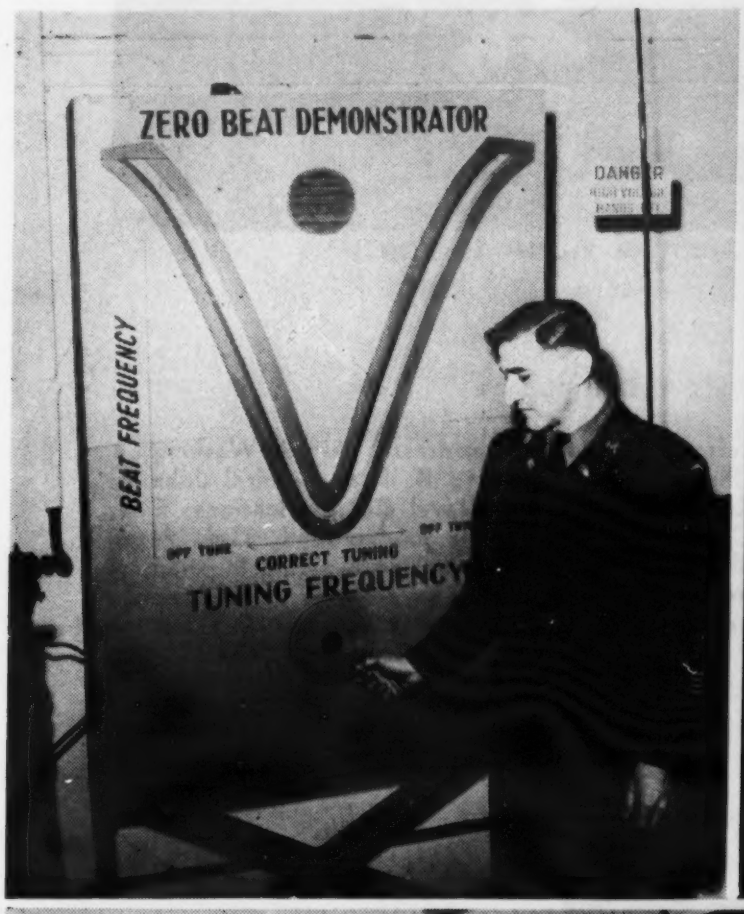
(Cover photo, and photos this page, by Robert F. Gates, assignment photographer, Army Pictorial Service.)

Training Aids Section, USAREUR Signal School, Ansback, Germany

On this and the opposite page are shown visual aids used at the USAREUR Signal School for teaching technical subjects. These "gadgets" are designed to take theory out of the text book and make it visible and practical.

The training aids section of the Signal School was established in the early postwar period when the necessity for turning out large numbers of students in a relatively short time made it evident that an organization was needed which would be responsible for all training aids used in the school.

After the organizing and training of personnel for the section was completed—Ger-



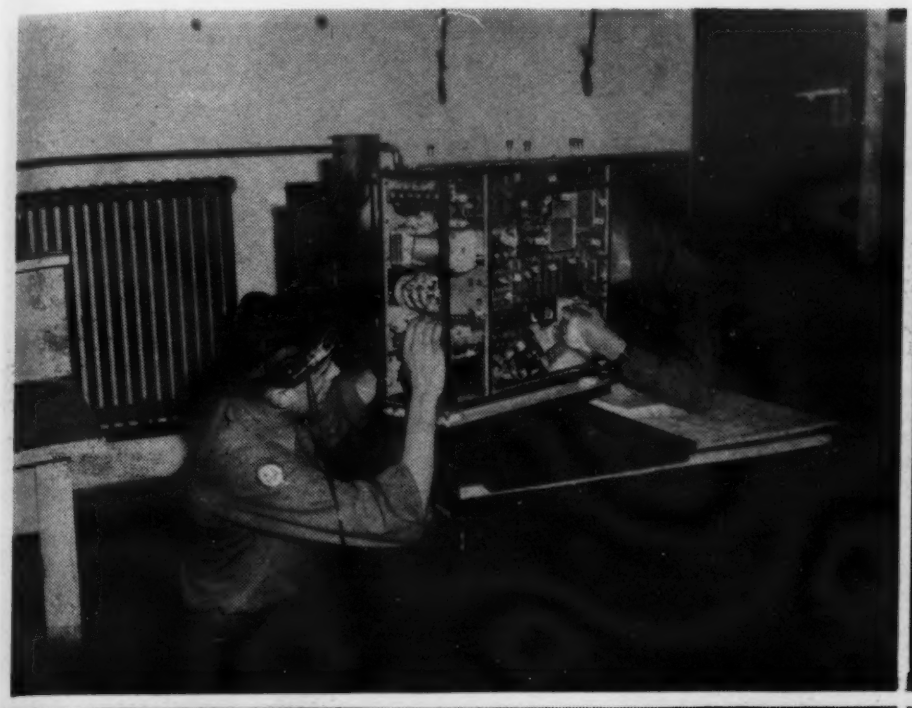
The photos and text for this and the opposite page were received from Captain William J. Cavanaugh, USAREUR Signal School. Captain Cavanaugh states that much of the credit for the success of the Training Aids Section of the Signal School goes to M/Sgt Thomas (no first name given) who has supervised or assisted in the construction of practically every training aid built by the section.

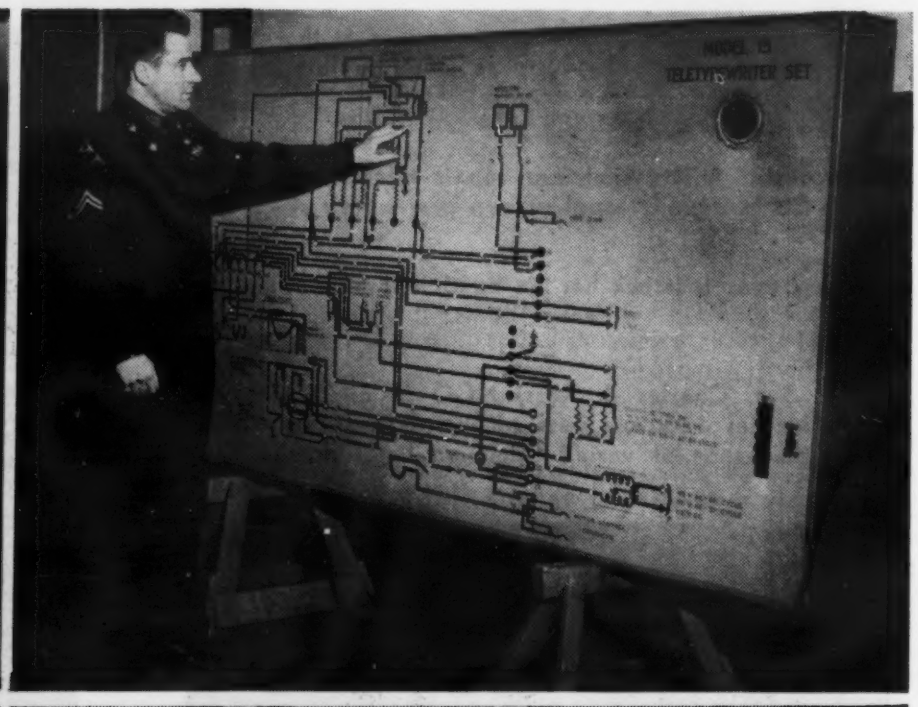
man or DP craftsmen being recruited—the new organization was soon handed the problem of aiding instructors in the teletype course who were having difficulty in teaching various teletype electrical circuits. After much research it was decided to construct a training aid on which a schematic diagram of the circuit would be placed. In each circuit small lights were installed with push-buttons which operated relays which in turn operated the lights. If a student, when tracing a circuit, pushed the wrong button a number of relays operated and caused a loud buzzing and a red light to light indicating his error. This solved the problem of teaching teletype electrical circuits.

A training aid which has attracted wide attention is an enlarged model of the BC 432 radio receiver. Requested to make a large size mock-up of the set, the training aids section not only made a mock-up of the set, but they made it a working set. The enlarged BC-342 is an exact replica of the original receiver, 10 times the size of the original.

The ability to tune or "zero beat" a radio transmitter to the same frequency as that of the radio receiver, or vice versa, has always been one that was difficult for radio operators to achieve. The training aids section solved this one by the construction of a device which allows the student to visually see what happens when he "zero beats" his transmitter and receiver.

These are just a few of the "gadgets" which are used to assist in visualizing the theory often not easily understood as presented in the text books. Instructors at the school find that training aids are not only invaluable for training personnel of the U. S. forces, but are also a great aid in instructing foreign students enrolled under the military defense assistance program. Training aids such as those described above have done much to overcome the language barrier in explaining the various techniques of communications to foreign students.





Rycom Signal Depot, Machinato, Okinawa—A Big Business

The photos on this page show activities in, and an outdoor stockpile view of the Ryukyus Command Signal Corps Depot at Machinato, Okinawa. The depot, run by the 8112th Service Detachment, 42 U.S. civilians and 300 Okinawans, currently is handling 27,000 supply items—which is a sizeable business.

In the past six months depot workers have salvaged half a million separate items of Signal Corps equipment and have repaired Army and Air Force items valued at over $6 million. In the same period the depot stocked 5000 measurement tons of supplies, shipped out 1696 tons, and re-warehoused (repacked, recrated, and reclassified) 9288 tons. The orders included a substantial amount of field equipment for Korea. Stock control processes 2000 documents a month, including requisitions on supplies ranging from metal screws for an EE-8 field telephone to trailer-borne radar sets.

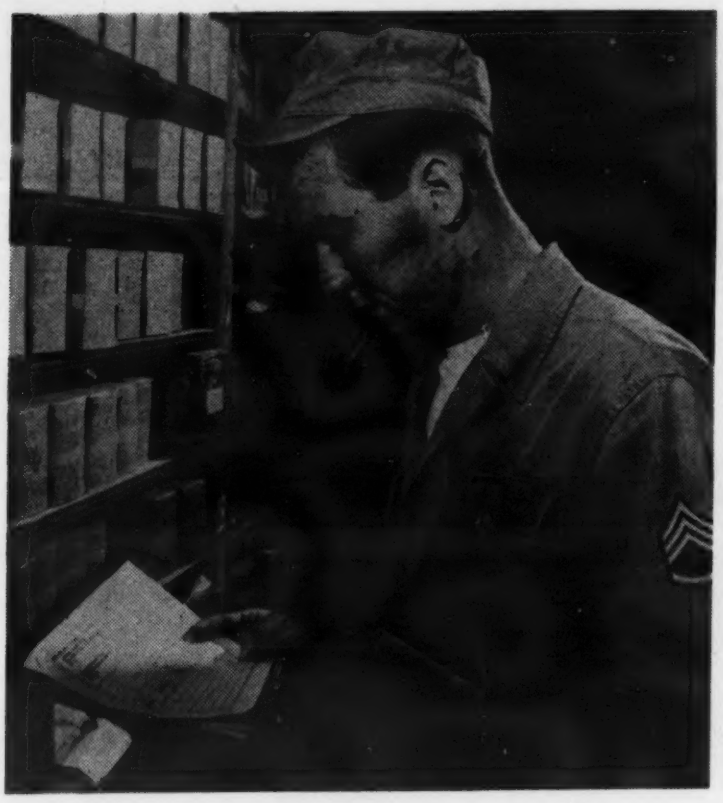
The depot is proud of its Okinawan workers and praises them for their cheerfulness and their quickness to learn. They perform duties from packing and wrapping to technical work. Several Okinawan girls repair telephones, and some can even read wiring diagrams. It is said that they can handle a soldering iron as easily as they do their lipstick.

Upper right: Okinawan girls wrap supplies at the depot, using utmost care, since supplies must be left outside for storage.

Lower right: Girl technicians repair telephones at the Signal Corps depot. Depot officers praise their efficiency.

Below: Depot binstock has on hand many thousands of different items.

Below: Sgt. Charles J. Ross, NCO in charge of bin stock, locates a supply item at the depot—one of the many thousands of varied items on hand in the bins.



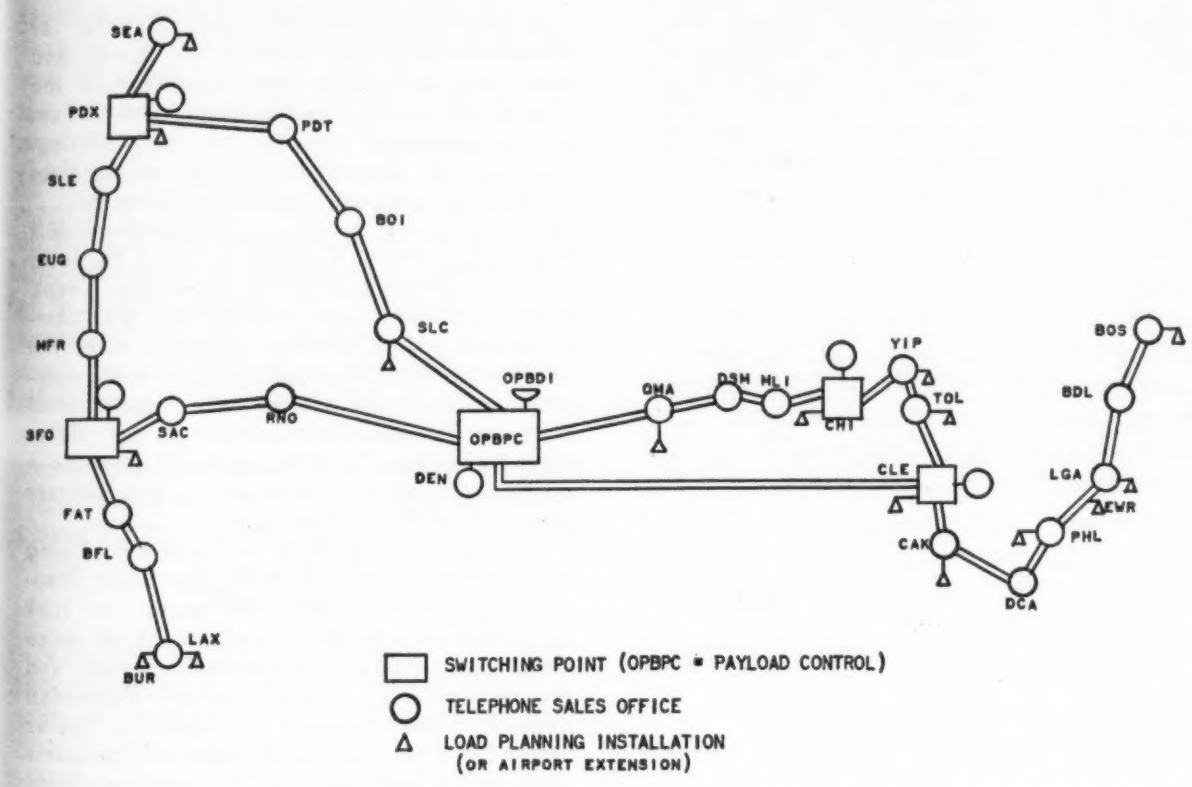
Below: Machinato taxi strip is a "runway" for trucks carrying supplies to the depot.

UNITED AIRLINES COMMUNICTIONS

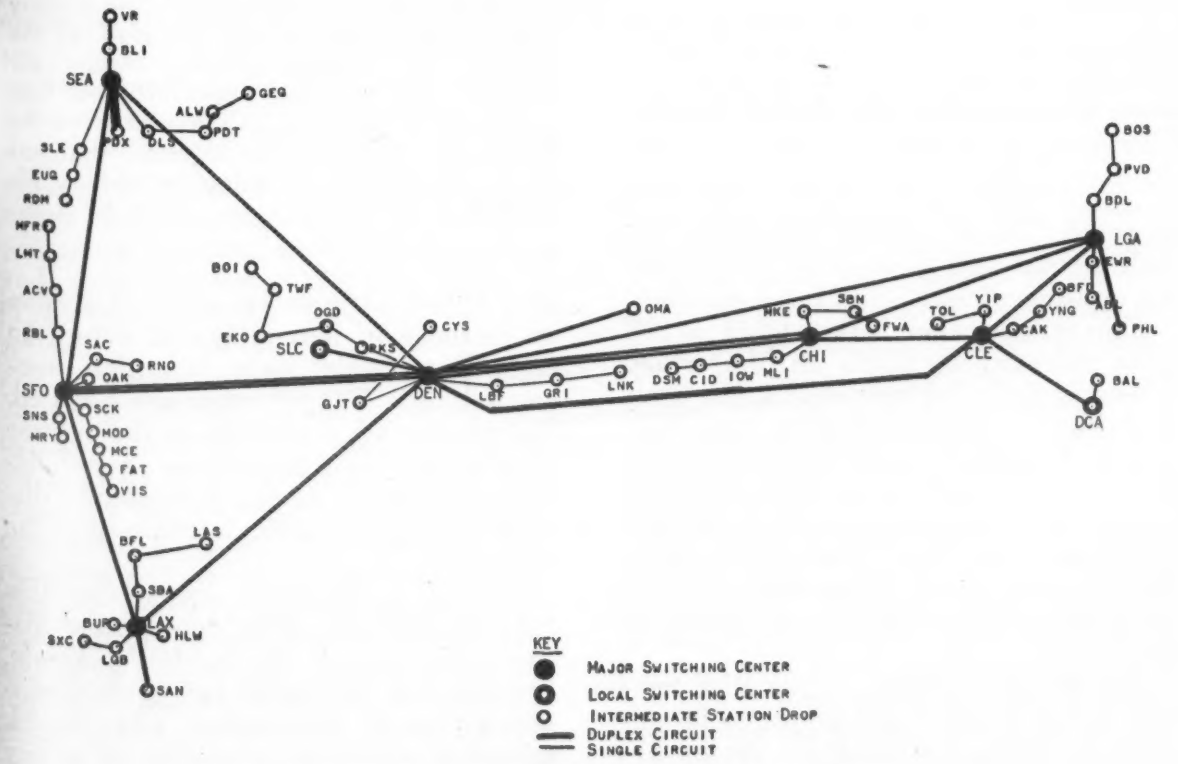
By J. R. Cunningham
Director of Communications, UAL

The communications network of United Air Lines will seem infinitely complex and of enormous extent to a layman. SIGNAL readers, however, many of whom were acquainted with similar systems in military service and many of whom are now associated with major branches of the communications industry, will recognize the company's facilities as the natural concomitant of efficient airline operations on a 13,250 mile system, linking 82 mainland cities and Honolulu.

United's communications setup includes 20,000 miles of leased teletype service, serving 72 points through 11 switching centers, and 13,000 miles of private line telephone circuits, connecting 30 operational and administrative points. The company has eight 5,000-watt and sixteen 400-watt high frequency transmitters, fifty 50-watt VHF ground stations, plus associated HF and VHF receiving equipment, manned by 250 licensed operators. HF and VHF transmitters and receivers are installed in each airliner, along with ADF, ILS and VOR equipment.



United Air Lines, Inc., Private Line Teletype System—Payload Control—Full Period Circuit (FP 444)



United Air Lines, Inc., Private Line Teletype System

Add to this array the separate circuits which provide local telephone, teletype, and control channels for radio installations at each of the 83 cities on the company's system and the general outline of United's communications is complete.

Centralized Operations Control

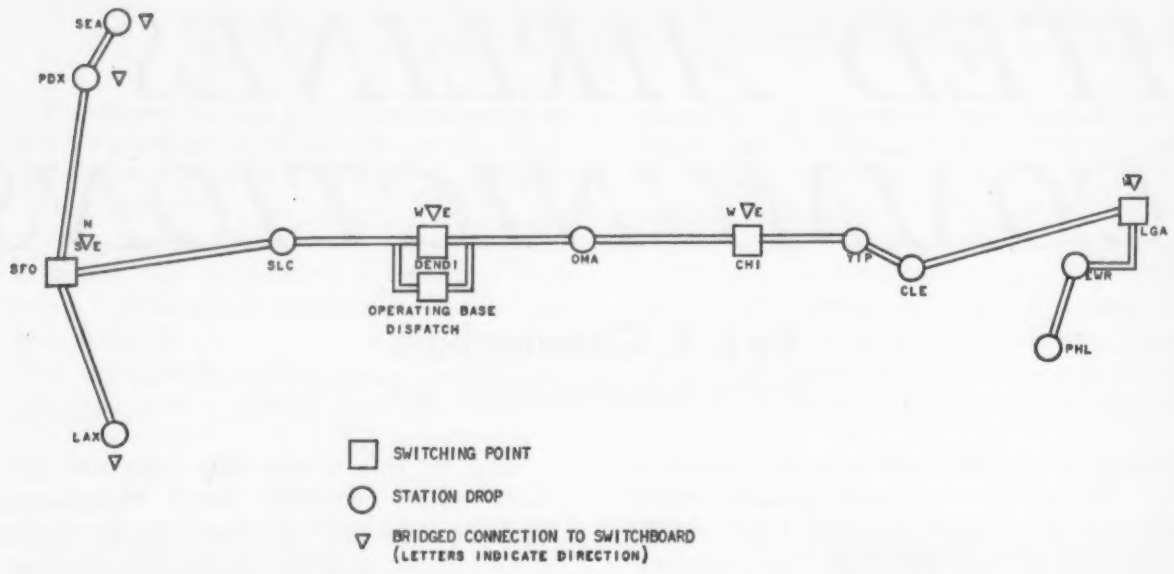
After World War II, United, having gained considerable experience in military contract operations, and with many of its employees returning from active duty, began to explore the possibilities of controlling its entire system from a centralized location. By late 1947 the feasibility of such a move had been determined. Denver, Colo., was chosen as location for a centralized-control base and each department concerned was assigned the task of planning for the new operation, similar in concept to "War Room" activities of the military services. The communications department submitted its plan, other departments concurred (not without misgivings in some instances), and the operating base was established in early 1948.

Centralized control subsequently has yielded steady dividends to United Air Lines. The ability to "check the pulse" of the entire system any minute of the day has resulted in improved operations and better service to the public. For its ultimate success, centralization has depended largely on modern communications systems.

Telephone Systems

An entirely new organization designated as "Payload Control" was set up at Denver for system-wide regulation of passenger and cargo space on all flights. This method of control allows for true "sell-and-record" action by reservations offices in the 83 cities along United's system. In other words, each office sells space until countermanded by hoisting of the "stop-sales" flag. Each sale must be reported to Payload Control within five minutes after it is made. Passenger reservations may be scheduled as far in advance as desired. Obviously, a fast and reliable system of communications is required to back up this function.

Payload Control uses a 6,000 mile private line telephone system (PLF) (FP) which fans out on four separate circuits from Denver, terminating at Reservations and Load Planning offices in the 28 cities that generate United's greatest volume of sales. The system may function as nine individual seg-

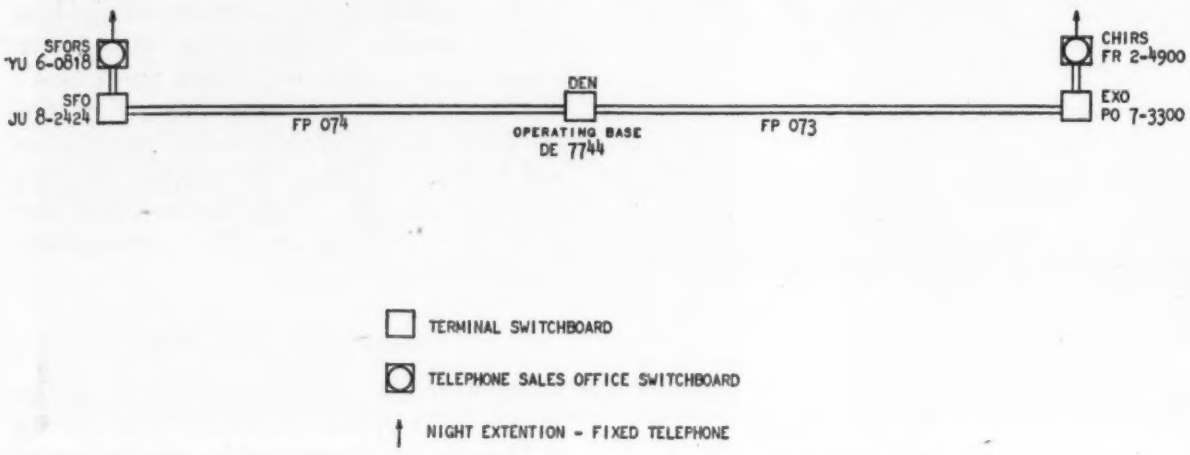


United Air Lines, Inc., Private Line Teletype System—Operations

ments, each capable of accommodating simultaneous transaction of inter-station business, or, at the flick of a key in any one of five "Switching" locations, it may be arranged to provide any desired circuit combination. Each of the four main circuits terminating in Denver is attended by a PLF operator equipped with 52-type headset and provided with an electronically operated machine for message copy and distribution. Incoming message traffic is "stick" copied on forms especially designed for this purpose, then is distributed to appropriate charting positions within the office.

With the exception of an occasional 1000-cycle note introduced to the circuit to alert certain "Load Planning" installations at airports, all signaling on the circuit is "voice." The use of voice signaling has been mastered to a fine degree by means of established call procedures, rigidly enforced. Keeping the circuit clear of ringing signals saves many minutes of valuable circuit time daily. Strict adherence to established procedures has made it possible to handle messages at rates as high as one every four seconds during peak periods. An average of one each seven seconds is considered normal.

Prior to provision of a telephone system to accommodate the Payload Control stipulation of guaranteed 5-minute delivery from any point on the system, there were those who believed that voice service would prove unsatisfactory. The main objection was based on the possibility of errors in transaction—of seri-



United Air Lines, Inc., Private Line Teletype System—Administrative—Full Period Circuits (FP 073-074)

ous concern to Payload Control because of the possibility of "over-selling" a flight. In approximately two years of operation, quality control checks, obtained by comparing written messages with voice-recordings, indicate an average of 99.5% accuracy—far above the established "control limit" for this type of message traffic.

In addition to the four operating positions in Payload Control, the service is extended to a "PLF Controller" position in the Denver office where equipment monitors the individual circuits through 100-type loudspeakers, and performs all the necessary switching operations to establish the desired circuit pattern. The control position has voice-operated "busy" visual indicators for each circuit and control of all recording equipment is at this same position.

The service also is extended to 18 other selected locations in the office. Incoming calls for specified areas such as Enroute, Advance, Cargo, and Passenger Expediter areas are routed by circuit attendants using simple push-button and buzzer signaling circuits with associated "line" visual lamp indicators, color-coded in accordance with the color designation of each circuit in use.

The actual capacity of this PLF System is not known but has yet to be exceeded. Traffic has surged from an average of 4,000 messages per day to well over 9,000, with no resultant confusion or increase in percentage of error. In compiling totals, only incoming messages to the Denver office are counted. No consideration is given to the volume of inter-station transactions on individual segments or to the occasional "discussion" type of traffic introduced to the circuit.

Use of a telephone system for this type of traffic handling has several distinct advantages. It is, for example, immediately available for general dissemination of information when quick adoption of a new procedure or policy is required. In a few seconds, the serv-

J. R. (Russ) Cunningham, director of communications for United Air Lines and third vice president and director of the Armed Forces Communications Association, is recognized as one of the country's authorities in aeronautical communications operations, research, and development.

A native of Spokane, Cunningham left Washington State College in 1917 to enlist in the Aviation Section of the Signal Corps, graduated from cadet school, and was commissioned a 2nd Lt. He resigned from the service in 1919, accepting a reserve commission. Later he served as a forest patrol pilot in Oregon. His airline career dates from December 1, 1926, when he became a pilot for Pacific Air Transport, a predecessor company of United Air Lines.

During his more than five years of flying the Portland-Seattle and Portland-San Francisco segment of United's route, he took an active role in the development of voice radio communications between planes and ground stations. In 1931 he was appointed general superintendent of United's Pacific Coast Division and, in October of the same year, was transferred to Chicago as assistant vice president-technical development. In February 1934, he became director of communications.

Shortly after the United States entered World War II, Cunningham went on military leave from United to join the staff of the director of communications, Army Air Forces. His tour of duty included four months in England as liaison officer to the British Air Ministry. He attained the rank of colonel before returning to civilian life in 1944.

ice can be set up for simultaneous "broadcast" of the new procedure to supervisory personnel in the 28 stations connected to the system. Such use also permits immediate solution of any problem that may arise at a field station.

Another advantage is the ability to "cut-back" during low volume periods by the simple expedient of placing certain segments of the system on a "temporarily suspended rate" basis. The "cut-back" lowers costs without impairing ability to contact any single station on the system. This feaure figured in United's communications planning and the circuits and switching points were arranged accordingly.

Telephone service for Payload Control eliminates the requirement for highly trained operators, a prerequisite of the efficiently operated teletype system. With a basic knowledge of the Payload Control function and a reasonable degree of proficiency in the use of established procedures, any person in the office can "take over" the PLF operating function when required.

In much the same manner as centralized Payload Control, all flight activities are regulated by the Base Dispatch organization in Denver. Effective exercise of this control depends on a constant flow of information from all points on the system, indicating the minute-to-minute status of flights and availability of aircraft. Immediate decisions must be made on alternate routing of aircraft, re-scheduling of equipment, and other matters peculiar to flight dispatch activities. An analysis of this requirement will indicate the necessity for "discussion" type traffic, which the telephone is tailored to fit.

"Ops PLF"

Thirteen established area dispatch centers and major stations concerned with the company's flight operations activities are connected by a private line telephone system of some 4,000 circuit miles. This system, known to United personnel as the "Ops PLF," connects the Denver Base Dispatch office with system operations offices on two main circuits extending east and west from the base. Since the service is primarily for intermittent discussion type of traffic, circuit signaling is accomplished by ringing. The present ringing system is of the "coded-ring" type. Selective signaling will be used when it becomes possible to perform switching functions and gain additional benefits from a "two-tone" or other type of selective system.

The service is arranged to provide for six individual segments which may be used simultaneously for inter-station traffic, with four switching points provided for the switching of any desired combination of circuits. Station termination of this serviec is, for the most part, in 1A type key equipment with push-button selection of directional service, a vacant push-button in the set modified to use for ringing on the circuit. The centralized Base Dispatch Office is provided with 100-type loud-

Cross-country staff meeting. Four microphones pick up their voices while a base speaker picks up voices in other cities.

speaker equipment for monitoring at will, arranged to be disconnected from the circuit with pick-up of any instrument in the office.

Traffic volumes on this system vary with conditions normally affecting flight operations. In order to increase circuit utility, the system PLF has been bridged to United's switchboards in certain key locations, providing switchboard access from station lines served from that switchboard. Thus, the service is available for administrative type traffic at any time when it is not being used for flight operations activities. Control of administrative use is exercised by flight operations personnel who may "close" the circuit to administrative use at any time when it is required for high priority operations traffic.

With establishment of the centralized Operating Base at Denver, a split in offices occurred which placed several staff officers at a considerable distance from the Executive Offices in Chicago and United's Maintenance Base in San Francisco. Frequent needs for administrative intercourse required the provision of purely administrative type circuits between Denver and Chicago, and Denver and San Francisco. A private line telephone system offered the practical solution, and two such services were installed for this purpose.

Termination of the administrative circuits is in United's PBX switchboard at each terminal. Utility of these services nears 100 per cent during the business day. To increase utility, the circuits are arranged for key transfer from the main switchboard termination to switchboard installations in reservations offices where personnel coverage is maintained normally until midnight. When the latter switchboard closes, a further switch transfer is made to a telephone in a selected area of the reservations office. Thus, 24-hour utility is possible.

The split in staff functions between Chicago and Denver also created a problem in holding staff meetings. Without considerable travel, officials no longer could sit in on the weekly staff sessions. To continue such conferences, use of the administrative PLF circuit between the Executive Office in Chicago and the Operating Base in Denver was considered both feasible and economical. Arrangements were engineered at each location to transfer the service from switchboard operating personnel the conference room in Chicago at any desired time. Equipment provided in the conference room is of the portable "tea-wagon" type and consists of an arrangement of microphones, loudspeaker, and AVC amplifier.

Staff Meetings

When staff meetings are scheduled, the "tea-wagon" is rolled into place, microphones set up on the conference table, and appropriate cord connections made to permit the discussion to proceed in exactly the same manner as though all staff members were present. Comments made in Chicago are heard over a loudspeaker in the Denver conference room and "break-in" operation makes it possible for any staff member in Denver to voice his thoughts at any time. Privacy is provided, since the service is automatically "taken-away" from switchboard operating personnel during the conference period.

All private line telephone service is on a leased basis from the AT&T Company. The services described have introduced many unusual problems because of their highly specialized nature and United's unusual requirements. In over two years of use, a remarkable record of "in service" time has been established.

Push-Button Teletype Service

United Air Lines' Private Line Teletype System, a service leased from the Western Union Telegraph Company, consists of some 20,000 miles of 65 speed teletype circuits serving 72 stations. Designed for utmost circuit utilization, the system provides maximum flexibility in the distribution of all types of routine record communications. The required flexibility is obtained through the use of seven major and three intermediate or local "switching center" relay installations.

A major rearrangement of the teletype system was required by establish-

ment of the Denver Operations Base. Previously, the system had been arranged for high volume traffic between adjacent major terminal stations, with San Francisco and Chicago handling the major portion of "switching" activity. The subsequent arrangement of service places Denver as the "hub" of a giant wheel with all major switching points connected by "telemeter" or "duplex" circuits handling Payload, Flight, Administrative, and Statistical Control messages, the latter type requiring hourly report to the Operating Base. In similar fashion, each other major switching center acts as a "hub," distributing traffic to intermediate stations for delivery over "way-wire" circuits.

Four of the major "switching" centers are Western Union "Plan 51" push-button type, the most modern switching equipment available to United at this time. The Denver Plan 51 installation is believed to be the largest of its type ever installed for a Western Union patron. This equipment provides such desirable features as (1) compact and efficient work-area due to the double-deck arrangement of push-button switching panel and typing perforators; (2) "flip-flop" termination of receiving circuits allowing for alternate reception of messages from a single circuit which provides, in effect, for messages to be switched "away" from the receiving position at the equivalent rate of 130 words per minute; and (3) a record of every switching operation, made possible through the use of "number-record" and "master-monitor" printers.

Messages arrive in each switching center in the form of perforated tape with printed copy of the message appearing immediately above the perforations. The tape is automatically fed up to the "gate" of a transmitter associated with each perforator position. By means of either "push-button" selection (in the Plan 51 switching center) or cord-connection (in the Plan 5 switching center) the tape is then fed through the transmitter to an outgoing circuit, or circuits in the case of "multiple-address" messages. Each circuit is assigned an appropriate two-letter designator. An associated "numbering" machine automatically assigns sequence numbering to the messages.

Five Min. Delivery Standard

United's Private Line Teletype System currently handles about 2,600,000 words (100,000 messages) in each 24-hour period with an average relay time of two minutes through major switching centers. Company standards require relaying of message traffic through these centers in a maximum of three minutes. Five minute delivery of messages between any two points on the system is the established and normally attained standard. The system may be expanded on short notice or "cut-back" in the same manner to effect economies during low volume periods, without changing existing procedures or policies. The use of Plan 51 Switching Equipment allows for considerable increase in traffic handling capacity without *corresponding* increase in personnel quotas.

A flick of a button sends a UAL Co. message coast to coast. Here at Chicago, one of the cities developed by Western Union for UAL, more than 40,000 messages were handled in this manner.

Radio—Aircraft and Ground

United's fleet consists of 133 aircraft —118 for passenger service (Mainliners) and 15 for cargo and air freight (Cargoliners). Seven Boeing 377's (Stratocruisers) serve the Honolulu route and 44 Douglas DC-6's provide 300 MPH service on domestic routes. The remainder of the fleet consists of 59 Douglas DC-3's and 23 Douglas DC-4's.

A pioneer in the use of "voice" communications, United led the field in the use of "voice" instead of "CW" for all ground-air and air-ground contacts. The use of "differential" type microphones to reduce transmission of background noise and utilization of improved grounded-type antennas which contribute power gains in the order of 10db have made satisfactory use of "voice" communications over long distances a matter of record.

Each Boeing 377 (Stratocruiser) is equipped with two separate 100-watt 20 channel HF Systems, 2 LF/MF ADF Systems, one 20 channel VHF Communications Unit, Marker, ILS, LORAN and High Altitude Radar Altimeter.

All domestic aircraft are equipped with one HF and one VHF Communications System, 2 LF/MF ADF Range Receiving Systems, ILS, and Low Altitude Radar Altimeter.

The RTCA SC-31 Committee "transition" plan for ultimate "All Weather" Air Traffic Control System is currently being implemented by United with the installation of VOR (VHF Omni-Directional Range) and service testing of DME (Distance Measuring) equipment. Following completion of these installations, the "Course Line Computer" and "Private Line" equipment now under development by the industry will be installed.

Aircraft Radio Communications and Navigations Systems which had their modest beginnings in the past decade have come to be the very "Eyes" and "Ears" of modern aircraft. The number of radio units required to provide these services has increased to the point that "consolidation" of the many controls is extremely important in order to avoid further complexity of the cockpit.

Need for a "consolidated" centralized control system, within easy reach of responsible crew members, was recognized at an early date and United designed such a panel for installation in DC-3 and DC-4 aircraft. The design was considered adequate for all foreseeable future expansion, but time and the multiplicity of new equipment have decreed otherwise. The DC-6 and Boeing 377 fleets are equipped with a new audio and control system keynoting "simplicity" and "centralization." Every effort has been directed toward minimizing pilot work load by reducing the number of controls. The use of concentric dials and switches has contributed materially in this respect. A new control panel designed for the addition of VOR uses six less switches than the panel used prior to the VOR installation.

For reasons of economy and to simplify maintenance problems, all airlines are aiming to achieve complete mechanical and electrical "interchangeability" of units common to different types of aircraft. Industry-wide acceptance of this sound principal has resulted in establishment of the "Airline Electronic Engineering Committee" of Aeronautical Radio, Inc., a group which coordinates the characteristics of all new aircraft radio units. This committee also functions under directive to coordinate airline and military requirements and, insofar as possible, arrange for interchangeability of civil and military aircraft radio equipment, an extremely important consideration in a national emergency.

Augmenting the airborne HF and VHF installations are company owned and operated ground stations which provide the vital air-ground-air link for handling some 7,500 operational and traffic control messages daily. Many hundreds of additional contacts are required daily with CAA approach, tower, ground, and departure control operation and comunications stations providing direct contact with CAA Traffic Control personnel for expeditious movement of traffic.

Although United has installed and maintains a few navigational aids, the great majority are, of course, installed, maintained, and operated by the CAA.

(*Continued on page* 60, *col.* 2)

PFC NATHANIEL OLEMAUN

of the

US SIGNAL CORPS

Pfc Nate Olemaun, Signal Corps, as a radio operator at Barrow, Alaska.

Located on virtually the top of the world, some 300 miles within the Arctic Circle, and situated on permanently frozen subsoil, lies the village of Barrow, Alaska.

At Barrow, the Alaska Communication System, an integral part of the vast communications network of the U. S. Army Signal Corps, maintains a radio station which provides the only means of contact with the rest of the world. Assigned to duty at ACS Barrow is Pfc Nathaniel Olemaun, whose history and background is most unique and interesting.

Centuries upon centuries ago, that part of Alaska which lies closer to Siberia than any portion of the North American Continent, became the campsite to a brand new world.

Probably the first race of people to visit the Arctic shores of Alaska were the Mongols of Asia, who migrated to the North over a period of many years. Out of this migration came our American Indians and Eskimos. The Eskimos apparently chose the northern regions because of their abundant hunting grounds, and eventually some of these immigrants in their travels to the North reached Utkiavic, or the village more commonly known as Barrow, Alaska.

One of these migrating Eskimos, whose name was Olemaun, also reached Barrow several decades ago, where he settled down to raise a family; and in the course of time and more families, a son, Nathaniel, was born, who now heads the still existing family of Olemaun at Barrow, Alaska.

Nate was born at Barrow 33 years ago, on the exact spot where the ACS operations center now stands. Today he is considered Barrow's leading native citizen . . . the leader of some 700 native people. He presides over the village council, but unlike most politically minded persons, Nate doesn't intend to run for a second term—at least that's the present viewpoint, with the next election still some time away.

During World War II Nate joined the Territorial Guard of Alaska as a buck sergeant, but upon the departure of the original commanding officer he was promoted to the rank of captain and served as commanding officer until the disbandment of the Guards. Weekly meetings were held and occasional drill. Although no action took place at Barrow, the Guards were held in readiness at all times in the event that they were needed. Since joining the Regular Army, however, Nate has had to resign his Guard activities, though the Guard is again reorganized.

Among Nate's other accomplishments are: village scoutmaster of a good-sized troop of native Boy Scouts; American Red Cross representative for Barrow Village; an elder in the local Presbyterian Church; and an interpreter for the pastor, the Rev. Samuel Lee.

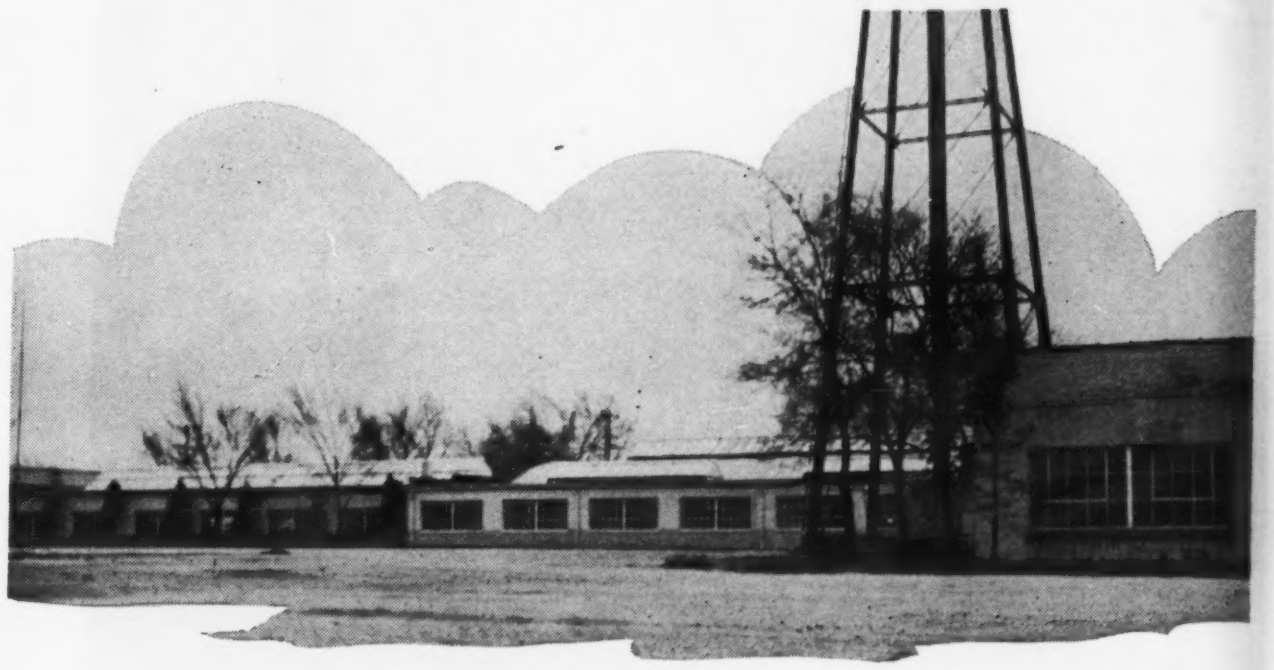
Nate is also very proud of his wife and fine family of five boys and one girl. Naturally, the light in the Olemaun family at present is the baby girl, Lottie May Olemaun, who was born on March 5, 1949. The importance of the arrival could not be determined by Nate's casual mention of the blessed event, but when he sheepishly admitted hitting himself on the head with a

(*Continued on page 66, col. 1*)

Olemaun as a diesel mechanic

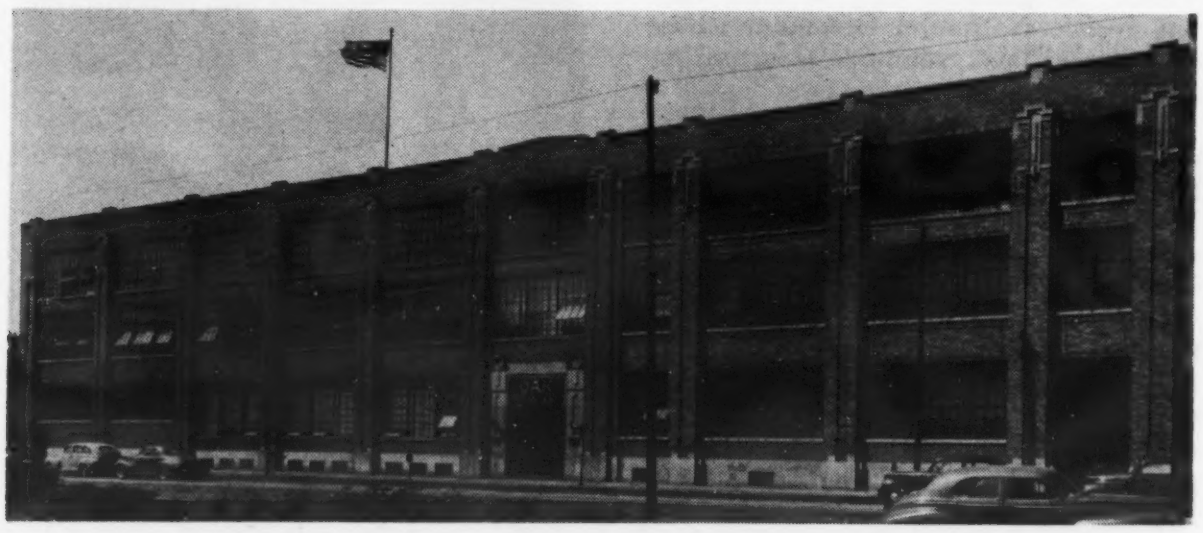
Olemaun and family

Oak Manufacturing Co.

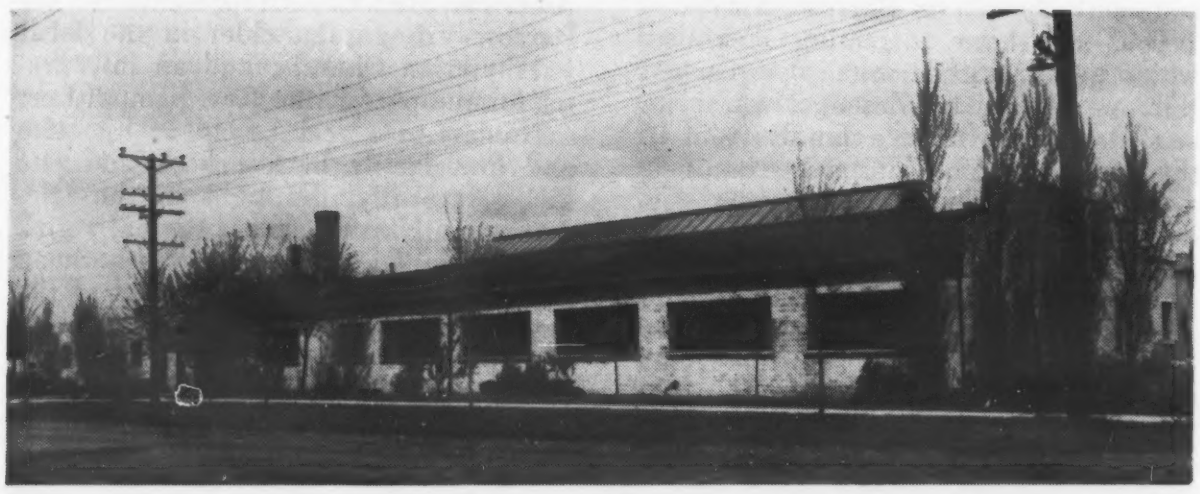


Right: Crystal Lake plant. Addition now under construction to front of water tower will provide 20,000 more square feet of factory space.

Below: The Chicago plant stretches more than 200 feet along Clybourn Avenue to a depth of 243 feet to Scott Street.



Lower: Crystal Lake factory about 1935.



Outside the radio and television manufacturing industry, probably few people have heard the name Oak Manufacturing Company. But if you have anything to do with operation of radio and radar equipment in the Signal Corps, Air Force or Navy, you undoubtedly operate some Oak part every time you receive or transmit. The worker in the shops and the engineers of "Prime Contractors" know Oak Switches and Vibrators as standard for quality and dependability.

Long before World War II Oak Mfg. Co. was specializing in the manufacture of radio switches in its Crystal Lake, Illinois plant. In this little town of about 3500 population, every other family had one or more workers in the Oak factory which was turning out as many as 35,000 band switches, push button switches and other switches every day in the busy season for radio set and other manufacturers. The Oak building was on the edge of town, fortunately with plenty of room for growth. Like Topsy, the plant grew and every few years or so, a new wing was added.

Even now, the newest addition, a 20,000 square foot assembly room, completed this Fall, is helping to relieve overcrowding in the factory. The demands of the television set manufacturers plus an increasing use of rotor and push button switches by industry in general made this new build-

Above: Interior view of Oak plant. Girls are performing the delicate task of eyeletting tiny silver contacts to bakelite wafers.

ing necessary before the Korean situation.

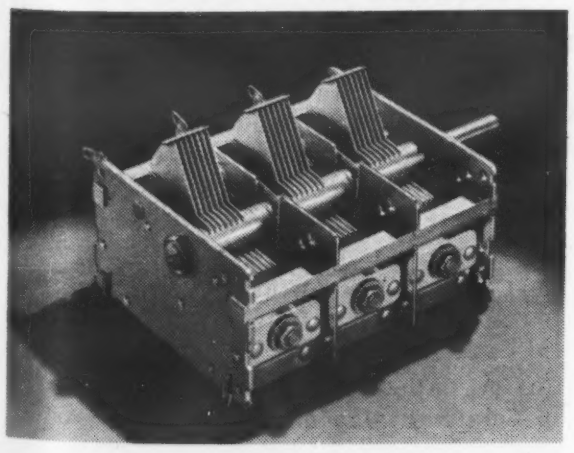
Of the thousands and thousands of switches Oak shipped each day, a few months ago, scarcely one percent were for our Armed Forces. Nevertheless the quantities have been so large that Crystal Lake has been a regular port of call for Government Inspectors.

It may be age, for the Crystal Lake factory is older than its sister plant in Chicago by a few years, or possibly the country air and the wide open spaces may have had something to do with it, but the Crystal Lake plant is Oak's show place.

The buildings at Crystal Lake were built to meet a particular need. The tool room is off by itself but convenient to the punch press department which, in turn, is next to the plating room. Screw machine and milling departments are in a separate wing. But all fabricating departments open directly to the large central assembly sections where switches and other products assume their completed form.

The equipment in this plant consists of a battery of multislide presses, each press capable of turning out from 2000 to 15,000 stampings an hour up to heavy presses for handling the punching of steel and bakelite.

Oak condensers are used as station selectors in home radios and also find frequent use in commercial test equipment.



Quality Equipment

The number of screw machines and milling machines can best be judged by the output of these departments which averages over 200,000 pieces in an eight hour day.

Many machines were specially built for their particular work. The company has always believed in the use of assembly jigs and fixtures to help the operators in their work.

The Chicago plant of the company is near the downtown section of the city. However, unlike the one story Crystal Lake factory, the Chicago plant is three stories with a full basement. In size the Chicago plant has grown to 170,000 square feet as compared to 90,000 square feet of factory space at Crystal Lake.

But in other respects the two plants are very much alike, in equipment and personnel; so much so that both plants can and do manufacture the same products at the same time.

Valuable Tie-up

During World War II, Oak Mfg. Co. made duplicate sets of tools for several complicated Signal Corps projects. Manufacturing was carried on at Crystal Lake and Chicago. In this way two separate sources of supply were available for these assemblies. Because of the tie between the two plants, each benefited from the experience of the other and the government was the gainer, in quality as well as quantity.

As Crystal Lake specializes in switches and tuners, Chicago has as its specialties vibrators, air gap capacitors, tuners and record changers.

The engineering department of the company is located in the Chicago plant. Each major product of the company has a section chief engineer with a corps of assistants, all reporting to the chief engineer. Of course, the coming of television has added to the size of the engineering department and a separate, well equipped and well staffed laboratory is set up for television. How important this phase of the engineering work will be in the armament program of the government, time alone can tell. But the development work with inductance tuning is already of interest to several government laboratories.

War Time Dependability

The product design and tool design groups in the engineering department have made a large contribution to the reputation Oak parts enjoy.

In times of peace, Oak Mfg. Co. likes to feel that it is a department of its customers making switches, vibrators, variable capacitors, tuners, record changers and other special assemblies. The company has both the know-how and the facilities for handling this work economically and efficiently. When World War II came, the company immediately changed from peace-time to war-time production, but it still served as a department of its customers. Only a very small portion of its output went to the government direct. However, heavy shipments of both complete Oak parts as well as components of them were made to Canada and our allies

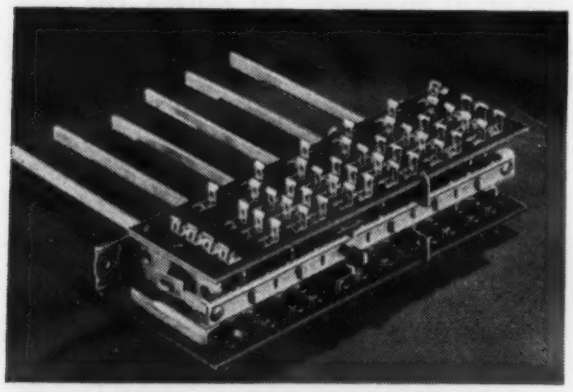
overseas. In England, the Oak type switch was adopted as standard by the RAF and competitors of the company used Oak designs for war use. The same was true for Australia.

This was both a worry as well as a source of pride to the company in that

First made for service in war equipment where it won its stripes, the versatile type "L" switch now finds wide use in civilian life.

its product was honored by being selected as the standard for performance and copied. But it did have one hidden advantage, for in the months shortly after VJ Day the company bought and brought back from England components which were in critical supply during those days of shortages.

In bull sessions around the lunch table, old timers at Oak frequently relive the days of World War II as



Oak push-button switches provide quick-as-a-wink selections in radio and television sets, in juke boxes, vending machines, and intercommunication systems.

they try to look into the future. They don't want war. But they agree that the nation must be ready to defend itself to insure peace.

They remember the excitement of the first Army and Navy E Award. However, the conversation turns to tolerances, and mechanical and electrical gadgets. Sure, they say, we made the tank tuner where pieces were tapped to tolerances of plus .0002, minus nothing; when shafts were centerless ground. They recall the help they gave in setting up a giant in American industry to make this assembly as a second source. And there was the BK 22 Relay, a relay in name only, where they sweated and cussed to reduce the weight of the assembly, which was used

Above: Upper photo, an engineer tests a television tuner built around an Oak rotary switch. Lower photo, girls working on a switch selection conveyor belt assembly line add parts, solder, and test.

in planes. And they did take weight out of it. They did these things then and they will do them again if necessity demands.

These factory men and engineers can take an idea, love it, and develop it into a product that can be made in production, utilizing the advantages of assembly belts and jigs and fixtures. The engineers, of course, want some development contracts, pure and simple. They are making progress on one now. But it is only a teaser to whet their appetites.

Essentially Sub-Contractor

The front office is more or less neutral. It knows that Oak is essentially a mass production company of sub-assemblies for other manufacturers. The company has a lot of fine equipment for fabricating metal and bakelite pieces with a trained personnel for assembling them into precision electrical devices. Test equipment of many kinds, both for mechanical and electrical tests, is available for production testing of jobs that run into the thousands or tens of thousand units.

Ideally, and this brings us back to the way the company has operated successfully through peace-time and war-time years, the company is a department of its customers. It has no grandiose ideas about being a big prime contractor. Rather, it feels that it might best do its part in the rearmament program by continuing to be a supplier to the big and little fellows who have need for a complete department, with its own specialized engineering and its own manufacturing set-up from tool design and tooling to the final assembly, to take over the responsibility of making a complete sub-assembly. Oak would like nothing better than to hold its reputation as a good sub-contractor.

This does not mean a lack of interest in government work. Far from it. Oak Mfg. Co. has engineers and production men available for working with governmental agencies.

The experience of World War II brought the company in close contact with many earnest, sincere men in government service. Frequently the company learned from them. Occasionally, out of exchanges of ideas, savings in cost developed and the end product was more satisfactory.

If it has to be an all out war we face, or a rearmament program that will take only part of the electronic industry capacity, Oak is ready to serve in whatever way our government elects.

the phantom STRIKES!

Harold A. Zahl
Narrator

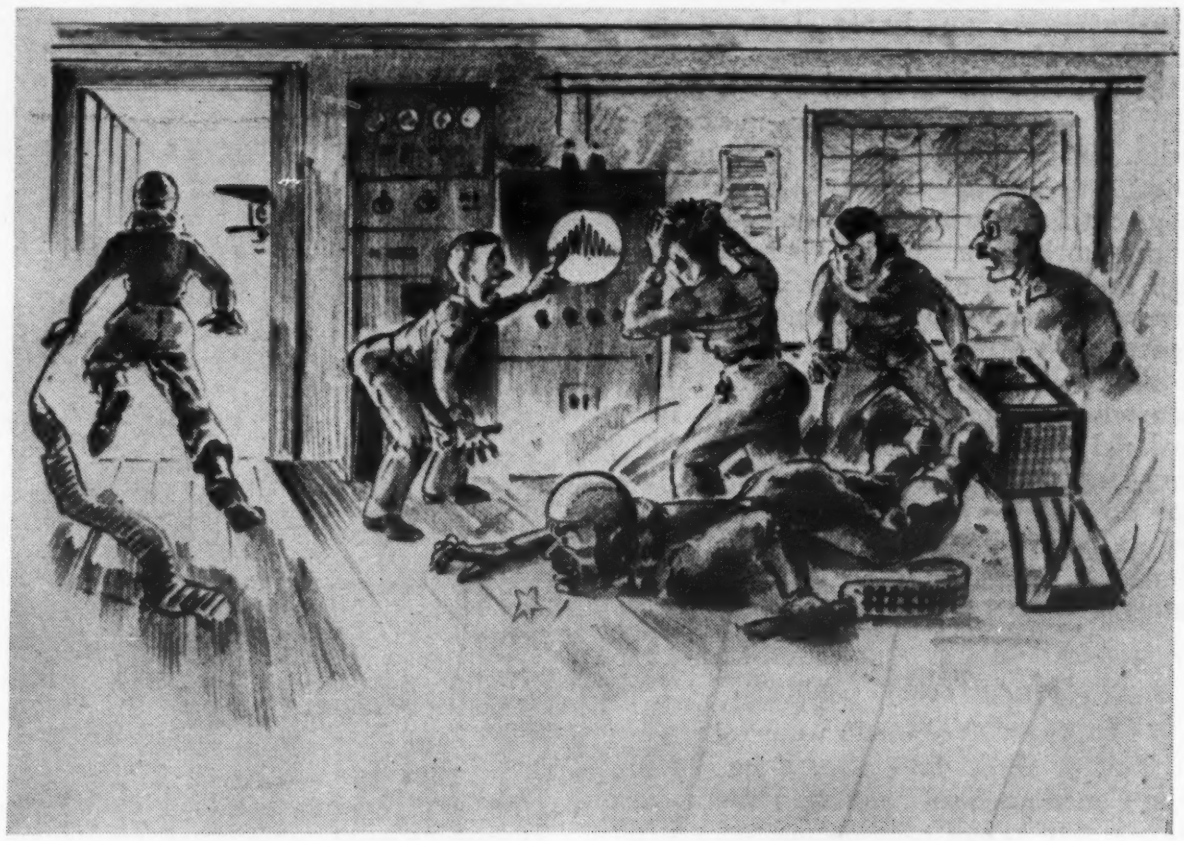
B. H. Christensen
Illustrator

This anecdote, and one to follow in SIGNAL *shortly, were taken from a collection of unpublished narratives prepared immediately following the close of World War II. Both stories are based on real wartime happenings. The author and artist, however, apologize for the obvious embellishments both in the text and in the illustrations. In preparing the narrative, the first person was used as a literary convenience and should not be taken as implying direct author participation in the sense suggested.*

•

During the period before, and early in the war, my job was to help develop radar. When the enemy struck we had the 268 and the 270 out in service, and while they were doing a magnificent job, they were crude compared to the beautiful gear we finished the war with.

Remember back at the start of the war when Goering's Luftwaffe was having its own way over Europe and England? Well—at the same time we were having a "minor league war" right here in our own United States and just over the border in Canada. Nobody got hurt, but it cost a lot of money, and plenty of nerves were put under terrific strain, while grey hairs were cropping up prematurely on the heads of quite a number of young lieutenants who had just started to shave. Let me tell you about it——.



"I knew what that meant — gun crews rushing out, fighter planes taking off — people tripping over each other — dollars down the drain —"

In those early days the Army was feverishly at work setting up a chain of early warning radar stations, which, with the help of volunteer visual observers, was to prevent surprise attack, should Goering decide to make a sneak raid. Through this chain it was hoped that sufficient warning could be achieved so that the civilian population could take cover, black-outs could be established, anti-aircraft guns manned, and the fighter boys could get up before the Jerries had opportunity to unload their stuff on vital areas.

A part of this vast system was the Central Air Defense Command close to the Canadian border. Tactical officers said the Nazi bombers might approach by the short polar route and come in over sparsely settled Canada, since much of our key industry is up that way, and the destruction of a few factories like ball-bearing for instance, could raise hell with our war industries.

Headquarters for this defense command were at Sault Sainte Marie, Michigan. To this nerve center continuous reports were fed from advance radar

outposts in Canada. I had worked on a number of these sets. Actually they were only the usual anti-aircraft 268 with a longer range sweep, with the whole thing mounted on a twenty-foot high platform to give a longer range.

At headquarters they had a big plotting board on which they tried to show all aircraft in the vicinity. If an unidentifiable flight showed up on the board it had to be assumed as enemy carrying swastikas or rising suns, plus a few tons of bombs. Everyone was jittery those days and in a mood to expect anything. After all, most of the Pacific was lost—Hitler had all of Europe—and Rommel was going great guns in Africa.

Gyp Pips

In the spring, and starting again in the fall of 1942, the big board showed up a lot of unidentified targets from the radar data. Whenever this happened, alerts were sounded, anti-aircraft crews had to jump and be ready for instant action, while fighters had to take off and search the skies in the reported target area — for no chances could be taken; Pearl Harbor was too fresh in everyone's memory.

But there was never any shooting following one of these dead serious alerts. No aerial duels appeared in the sky. The psychological situation was bad and grew worse with each false alarm. The nerves of everyone were on the ragged edge. Radar was under accusation of being unreliable—but yet, no one was sure but that perhaps it was Hitler testing our defenses and that one day he would strike swiftly, unexpectedly, and in deadly earnest. But in the meantime, morale went to hell, and during that first spring very few people up there working in the net were able to get their quota of sleep, for on an alert everyone went into action regardless of shifts.

After a lull in the summer, the thing started repeating itself in the fall. The colonel at the labs where I was working had requested a radar expert to go up and work with the crews in an effort to run down this phantom target business. I was told to leave immediately and stay as long as necessary.

Here They Come!

Two or three days after I arrived in the Canadian bush country, I was looking at the range oscilloscope of a 516 when a beautiful radar "Pip" showed up on the scope—three-to-one signal-to-noise. Report was made to the headquarters at Sault Sainte Marie, "TARGET—AZIMUTH 270—RANGE 38,000 YDS — SEEMS TO BE MOVING SOUTHWARD."

Back from headquarters came the following message, "CONTINUE TRACKING AND REPORTING — NO FRIENDLY AIRCRAFT KNOWN TO BE IN REPORTED AREA — ALERT BEING SOUNDED."

I knew what that meant—gun crews rushing out, fighter planes taking off—people tripping over each other in the rush—dollars down the drain and further sinking of morale, if the alarm was false.

After a short period of observation and by making rough plots at the station, we were all startled, but delighted, to note that unless the target changed course, he or they would fly directly overhead. In previous cases of the phantom target the course flown always missed the radar sites by such a distance that a correlated visual observation had never been possible. Now it looked as though our big chance was finally coming. The charted target speed was only about 60 miles per hour —too slow for any known bomber type, but it could be a modernized version of the old lighter-than-air Zeppelin. I wondered too, for a moment—could we be the objective? But no, that was ridiculous—compared to Detroit we were peanuts.

After watching the radar echo build up and show its various characteristics, several of us stepped out for a look when the range indicated was about 10 miles. With binoculars we searched in the direction pointed out by the radar. One of the enlisted men saw them first —then quickly we all picked them up in our glasses!

Phantom of the Operation

Flying noiselessly, and in beautiful formation at about 2,000 feet — there were about fifty of them, bearing directly down on us so as to pass overhead—no, not Jerries, wild Canadian geese!

Here was the answer we were looking for. The phantom was not a new terrible weapon of war with a swastika on it. Radar and its pioneer operators were new, and the art was in its infancy. On an oscilloscope, echoes from an airplane and from a flock of geese looked surprisingly alike. Furthermore, the spring and fall effect was easily explained. In the spring the birds fly north, while in the fall they fly south—while between seasons no phantom targets occurred. One could hardly expect the war to change natural instinct, but at least—now radar has its own wild goose story to tell!

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"— No, not Jerries — wild Canadian geese!"

TIME SIGNALS

Right: Naval Observatory. Building on left houses photographic zenith tube, building on right houses 40" reflector.

This busy world has come to depend more and more on accurate time. However, few people realize the amount of effort that goes into providing time standards. The results of this effort are manifested in time signals which are based on observation of the stars. The U.S. Naval Observatory in Washington has a set-up that assures exact time for this country and other places in the world. From the observatory, time signals are produced which are accurate to an average computed error of 8/1000th of a second. They are relayed by radio and telegraph to control clocks throughout the country and to ships at sea.

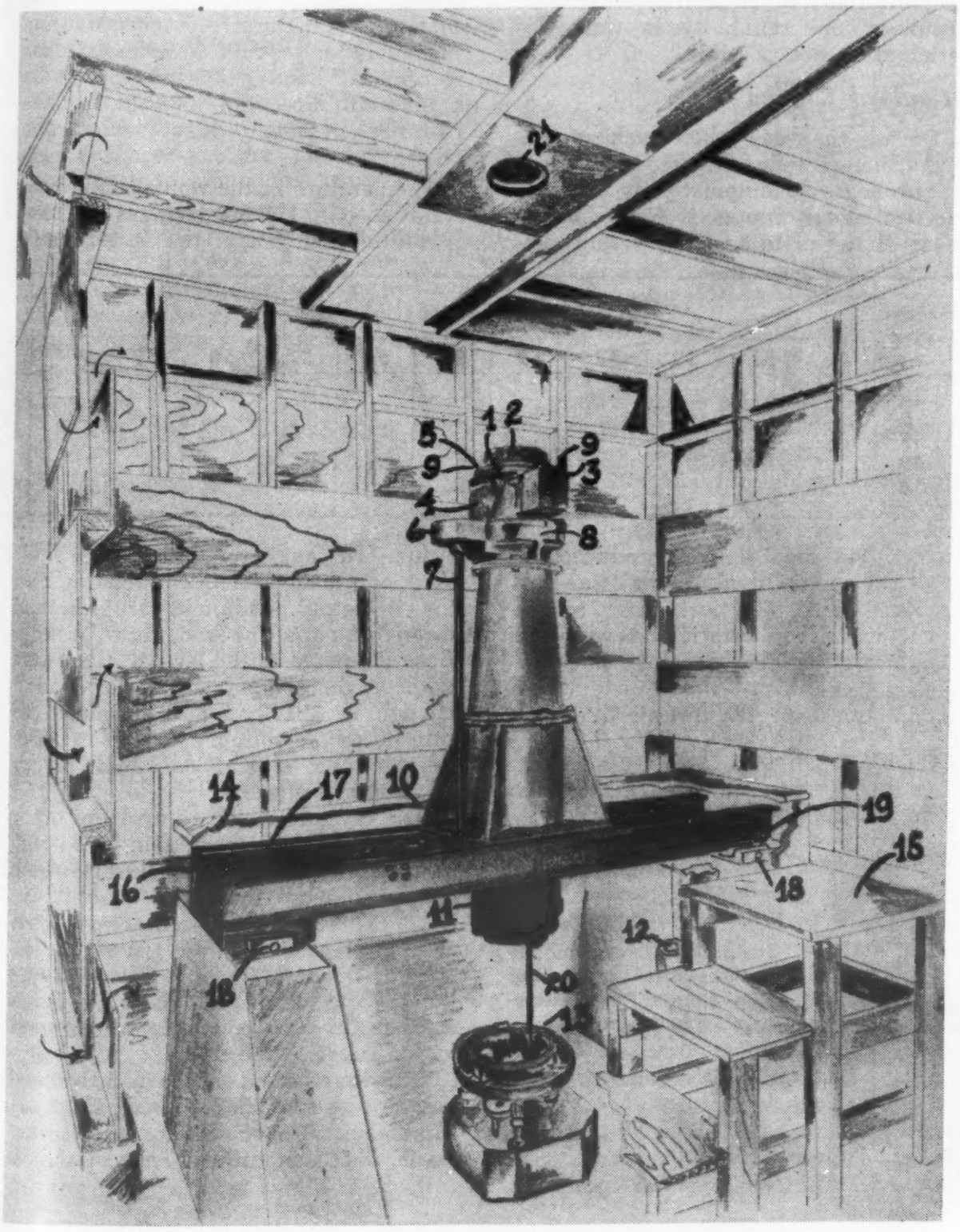
Basis of Time Measure

The accepted basis of time measurement is the earth's rotation on its axis. The rate of this rotation is usually considered uniform. This rotation causes the sun and the stars to appear to cross the sky from east to west. If a person located on the earth's equator, measured the time interval between two successive passages overhead of a very distant star, he would thereby measure the period of the earth's rotation.

Time Determination

In order to determine time with high precision, it is necessary to observe stars, or other celestial objects, with a telescope. Such observations are most conveniently and accurately made when the stars are passing over the meridian at the place of observation. The meridian is an imaginary line in the sky, passing through the zenith and the north and south points.

At the Naval Observatory an instrument called the photographic zenith tube is used for time determination.



Left, Photographic Zenith Tube No. 2 located at Richmond, Florida, designed and built by the Naval Observatory, Washington, D. C. Lens aperture, 8 inches; focal length, 149 inches. Key to figures on drawing is as follows:

1. Rotary
2. Lens Cell
3. Photographic Plate Drive Mechanism
4. Photographic Plate Access Door (2 spaced 180°)
5. Level (2 spaced 90°)
6 Rotary Reversing Gear Cover
7. Rotary Reversing Gear Drive Shaft
8. 180° Stops (2)
9. Setting Microscopes (x 2 spaced 180°) —
10. Rotary Reversing Gear Mechanism
11. Telescoping Hood
12. Hood Counterweight
13. Mercury Basin
14. Operating Platform (3 sides)
15. Service Steps
16. Rotary Reversing Motar
17. Rotary Reversing Motor Brake
18. Instrument Orienting Screws (4)
19. Instrument Leveling Screws (3)
20. Focussing Rod
21. Roof Aperture

This instrument is rigidly fixed in a vertical position, and therefore cannot photograph any objects except those which pass very near the zenith. At the lower end of the tube is a basin filled with mercury. The light from a star passes through a lens at the upper end of the instrument, continues down through the tube, is reflected

from the mercury surface, and comes to focus on a small photographic plate located just under the lens. The location of the plate may be tilted as a unit, through a small angle, without sensibly altering the position of the image on the plate. If the plate and the lens are rotated through 180°, then the distance on the plate between the images of the star, before and after reversal, corresponds to twice the zenith distance of the star. Were it possible to take both photographs in the same instant, when a star was exactly in the zenith, the two images would coincide and the time of meridian transit would be the time when the photograph was taken. In actual practice the plate is driven from west to east so as to keep pace with the motion of the star's image, and the clock time at which the plate is in certain positions is automatically recorded. The images obtained before and after reversal do not coincide, but by measurement of the distances of the images it is possible to determine the positions of the stars during exposure, and to reduce the times of transit. Recently a second photographic zenith tube station has been located at Richmond, Florida. With the aid of this second instrument of improved design, and the advantages of more favorable latitude and a greater percentage of clear nights, greater accuracy and reliability in time determination are possible.

The stations listed below transmit time signals for five-minute periods ending on the hours listed. Under the call letters of each radio station are listed the frequencies in kilocycles used in transmitting via these stations.

Greenwich Mean Time	NSS	NSS	NSS	NSS	NSS	NPG*	NPM*	NBA*
Oh	122	4390	9425	12630	17000	115		
2	122	4390	9425	12630	17000			
3						Note 1		
4	122	4390	9425	12630	17000		Note 2	
5								Note 3
6	122	4390	9425	12630	17000			
8	122	4390	9425	12630	17000	Note 1		
10	122	4390	9425	12630	17000			
12	122	4390	9425	12630	17000			
14	122	4390	9425	12630	17000			
15						Note 1		
16	122	4390	9425	12630	17000		Note 2	
17						115		Note 3
18	122	4390	9425	12630	17000			
20	122	4390	9425	12630	17000	115	Note 2	
22	122	4390	9425		17000			

Note 1: 115, 9255, and 12540 kc
Note 2: 113, 4525, 9050, 13575, 17370, 21990 kc
Note 3: 148, 5005, 11080, 16470 kc

*Second-order time signals. These are time signals for chronometer rating and ordinary use, normally correct as broadcast to less than five-tenths of a second, having a generally constant lag.

Standard Clocks

During the time when each star is being photographed by the zenith tube, a chronograph automatically records electric signals produced by the movement of the plate carriage in the telescope, and also signals produced by the ticking of one of the standard clocks. Thus the clock time of the star's transit is determined within a small fraction of a second. By comparing these clock times with the theoretical times of star transit, the clock error is determined.

Pendulum type clocks were originally used as standards. They are now maintained as stand-by equipment. These pendulum clocks are installed in an insulated vault thirty feet under ground, away from vibrations and changing temperatures. Each pendulum swings in a vacuum to eliminate air resistance. Each pendulum swings in a different direction, too, so that the vibration of one will not affect the other.

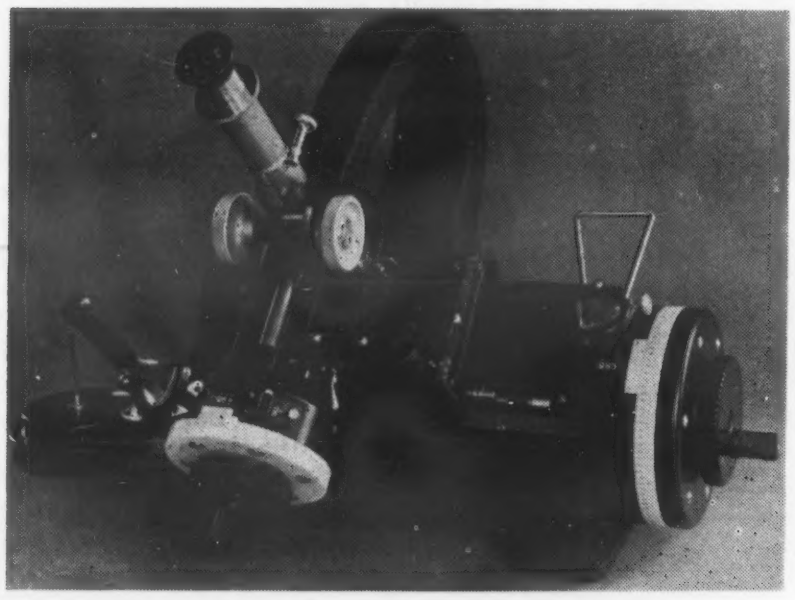
Temperature in the vault is kept constant at 85° F., for changes in temperature also vary the pendulum's swing. No one ever enters this vault except to make infrequent repairs, and the swinging pendulums are watched through a periscope from above ground. Even a change in the level of the water table in the ground will make enough change in gravity's pull to alter the rate of a pendulum's swing. Consequently the crystal-controlled clocks are more accurate.

The crystals which control the other master clocks are sealed in a vacuum and maintained at a temperature which varies no more than 1/100th of a degree. These crystals oscillate at a frequency of 100 kc. By means of frequency dividers, a stable power supply of 1000 cycles is obtained. This is used to drive a 1000-cycle synchronous clock motor.

The function of the clock movement is to show the elapsed time interval. Several crystal-controlled clocks are used as standards. They are all

(*Continued on page 66, col. 1*)

Minutes	Seconds										
	50	51	52	53	54	55	56	57	58	59	60
55	---		---	---	---	---					---
56	---	---		---	---	---					---
57	---	---	---		---	---					---
58	---	---	---	---		---					---
59	---										---



Comparator (measuring engine) used to observe star images from the photographic zenith tube.

The Making of Capacitors For Peace and War Needs

One electrical device—the condenser, now called a capacitor—has virtually revolutionized electrical engineering.

This is an old invention but a recent development. Any electrical or electronic such as television, radio, or other electronic apparatus, however complex, is composed essentially of one or more devices employing inductance, resistance, or capacity. The use of inductance permitted the development of transformers, electromagnets, electric motors, generators, and similar appliances. The use of resistors made possible the development of electric lights, electric heaters, controls and the like. But modern electrical engineering would have been impossible without the use of condensers. Millions of condensers, of many types and sizes—some of them very tiny, used for hearing aids and electric razors, others as large as freight cars used for power factor correction.

Forty years ago, in 1910, we already had a sizable electrical industry, based primarily on electrical devices employing only inductance and resistance. The only practical power condenser then available was the glass Leyden jar—or its equivalent, the glass plates. The telephone and telegraph industry, operating with only minute energies, had a primitive low-voltage, low-power paper condenser. For higher voltages and higher powers, glass plates or the equally inefficient, cumbersome, fragile Leyden jars were used.

Leyden Jar Substitute

Nevertheless, there were in 1910 many thousands of high-tension, electro-medical machines, and thousands of wireless telegraph installations—all using the fragile jar. Radio communications with ships at sea, and between ships of all the navies of world, also depended on the Leyden jars. This jar was invented in 1746 by Deen Van Kleist, and remained practically unchanged all this time, retaining essentially the same shape, design, and construction. Practically all the jars were made in Germany. The German government subsidized the industry, and discouraged foreign development.

This was the case up to 1912—all commercial and other wireless equipment used Leyden jars made in Germany. The British navy realized that their entire communication system was dependent on a foreign power. And when Mr. William Dubilier was visiting in England in 1911, the government invited him to assist it in finding a substitute for the Leyden jar. This led to the founding of the Dubilier Electric Company, which later manufactured capacitors and other electrical equipment.

At the time he founded this company Mr. Dubilier still was only twenty-three years of age, but already he had begun to make a name for himself. After attending high school in New York City, he was employed by the Western Electric Company. After a little more than a year, Dubilier decided to continue his technical training at Cooper Union Institute of Technology, so arrangements were made whereby he attended school from 9 to 3, and then worked in the Western Electric Laboratories at night.

Later he established a laboratory at Seattle, Washington. Under the name of Commercial Wireless Telegraph Company, he issued his first catalog in 1909, offering to supply capacitors and other wireless equipment. In the latter part of the following year the Seattle Times carried a story about weird voices coming through the air, reported by various stations operating wireless telegraphy receivers. These were traced to Mr. Dubilier's experimental station. This discovery was so far-reaching and important that foreign governments sent representatives to witness the voice demonstration by wireless telephone.

During the first World War, the Dubilier Company was the only supplier of capacitors for all of the equipment used by the United States and Allies. During that period hundreds of thousands of large capacitors were made annually, but the company established the proud record of delivering all orders on time. To do this, Mr. Dubilier and his employees used to work day and night and sleep at the plant.

The first factory for manufacturing capacitors was started at 18 New Street, New York City, but soon afterwards moved to larger quarters on Canal Street. The next move was to 217 Centre Street, thence to Fourth Street.

Shortly after the war, people began

Octave Blake, president of Cornell-Dubilier Electric Corp.

Below: Young Dubilier's "wireless phone" made a front page splash in 1910 Seattle Times.

ALL THE NEWS THAT'S FIT TO PRINT | First Edition

SEATTLE BOY TAKES WORLD RECORD

Invents Wireless Telephone That Reaches Tacoma

The Seattle Sunday Times

SEVENTY-FOUR PAGES — SEATTLE, WASHINGTON, OCT. 30, 1910. — FIVE CENTS

HEART PIRATE'S CHICAGO PLUNGE PROVES UNDOING

Mrs. Alice Eckle-Bowes-Goodwin-Graham-Young-Hoskins Faces Bigamy Charge Made by Next to Last Spouse.

HE STILL LOVES HER, BUT ASKS FOR "PINCH"

Woman With Much Hyphenated Name Says She's "Awfully Fond of Men," but Just Must Have Some Variety.

Young Inventor and Perfected Wireless Phone

WIZARD YOUTH PLUCKS VOICES FROM THIN AIR

Seattle May Be Made Famous by Astounding Success of Young William Dubilier With Wireless Telephony.

BIG FACTORY TO MAKE INSTRUMENTS PLANNED

Triumph Crowns Career Almost as Romantic and Unusual as That of Great Figures of Lincoln's Period.

Left: Several types of proximity fuzes which were developed for use in Navy guns during the war.

to hear about receiving radio programs at home, and in 1920 broadcasting started. There was an immediate demand for radio receiving sets as well as transmitters by the larger stations. Mr. Dubilier's business grew so rapidly that it was necessary for his company to seek larger quarters. Thus another move—this time to the Bronx, where the company secured 70,000 square feet of manufacturing facilities. Twenty-five engineers were engaged in experimental work, and 400 to 500 persons were employed. The principal product was the small capacitor known as Dubilier "Micadons." These were used in practically all types of radio receiving sets.

Sometime thereafter another smaller manufacturer started in Long Island City at Rawson Street. The company was known as the Cornell Electric Manufacturing Company. It had a new capacitor for radio receiving sets which rapidly displaced the by-pass filter, because of its small size and its construction, besides having started making fast strides in the manufacture of electrolytic-type capacitors.

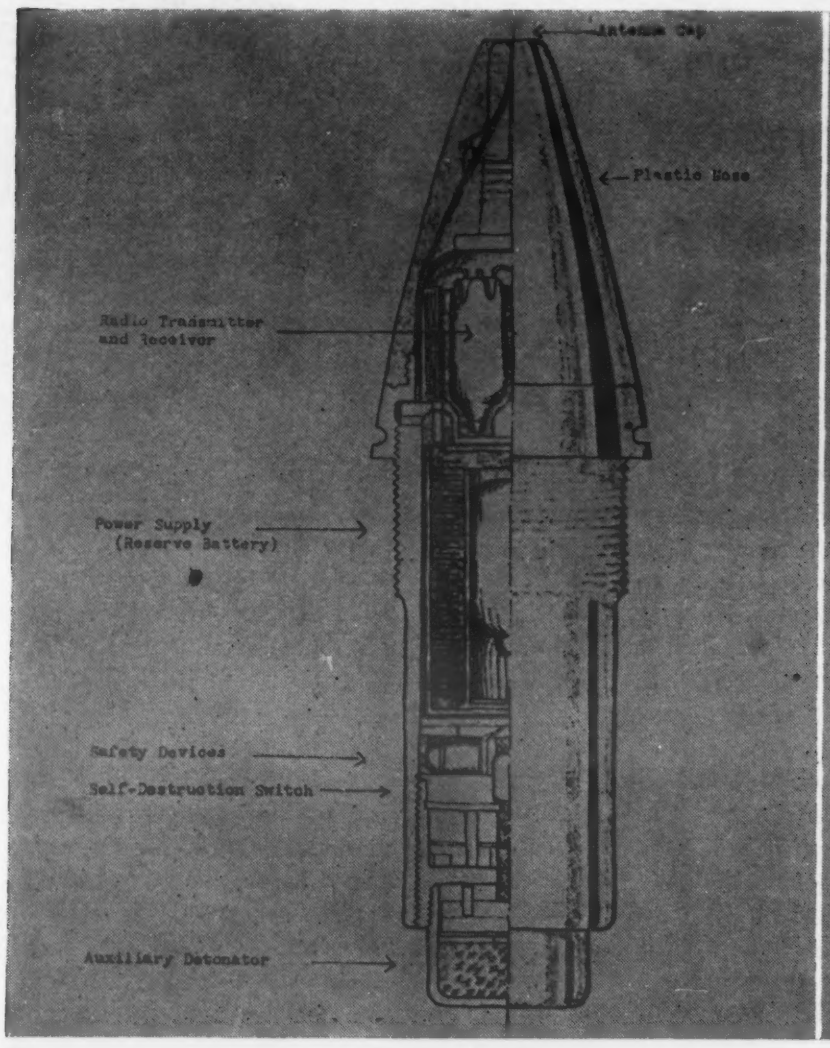
As time went on the Dubilier Company began to feel the terrific competition and its sales and personnel diminished steadily. In the Spring of 1933 Dubilier decided to combine with this very fast growing Cornell Electric Manufacturing Company. The necessary arrangements were made and the two companies were combined, having since that time operated under the name of Cornell-Dubilier Electric Corporation.

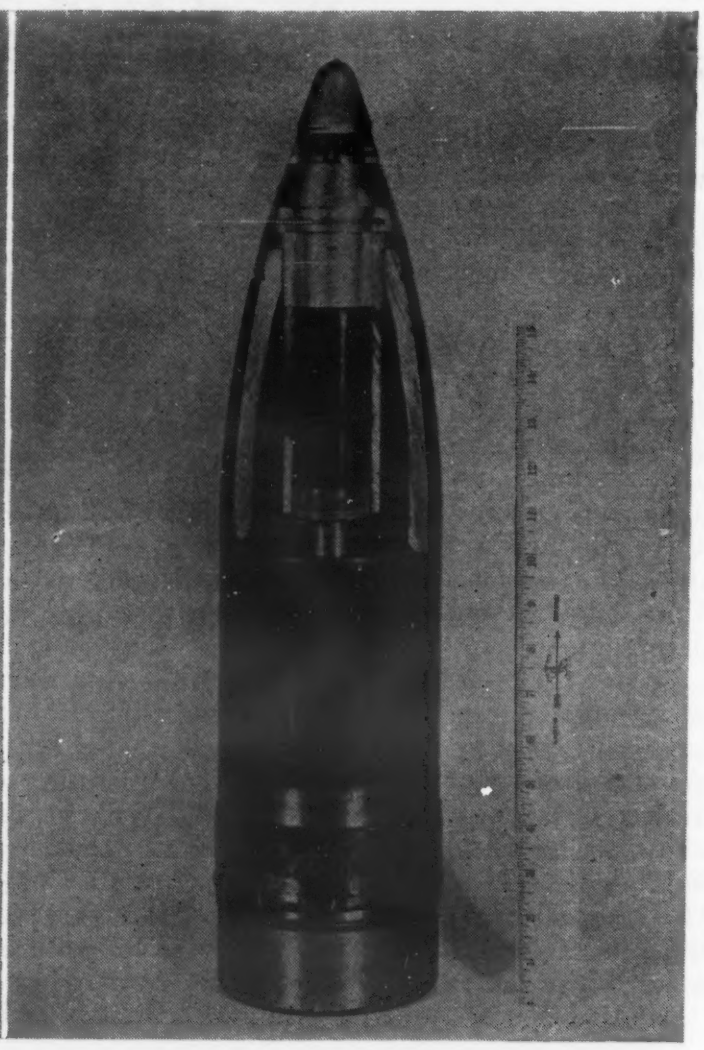
In a very short time business picked up, due to the new management and the co-operative efforts of its workers. The number of employees steadily increased.

Through the efforts of the employees, steady increases were made in production; new types of capacitors were developed for ice boxes, lighting, power factor correction for utilities and electronic applications almost too numerous to mention. Finally in 1934 the plant acquired by Dubilier at 4377 Bronx Boulevard became too small. Then we had to hire office space in another building across the street. Our customers liked our service and workmanship so well we had to increase the number of employees.

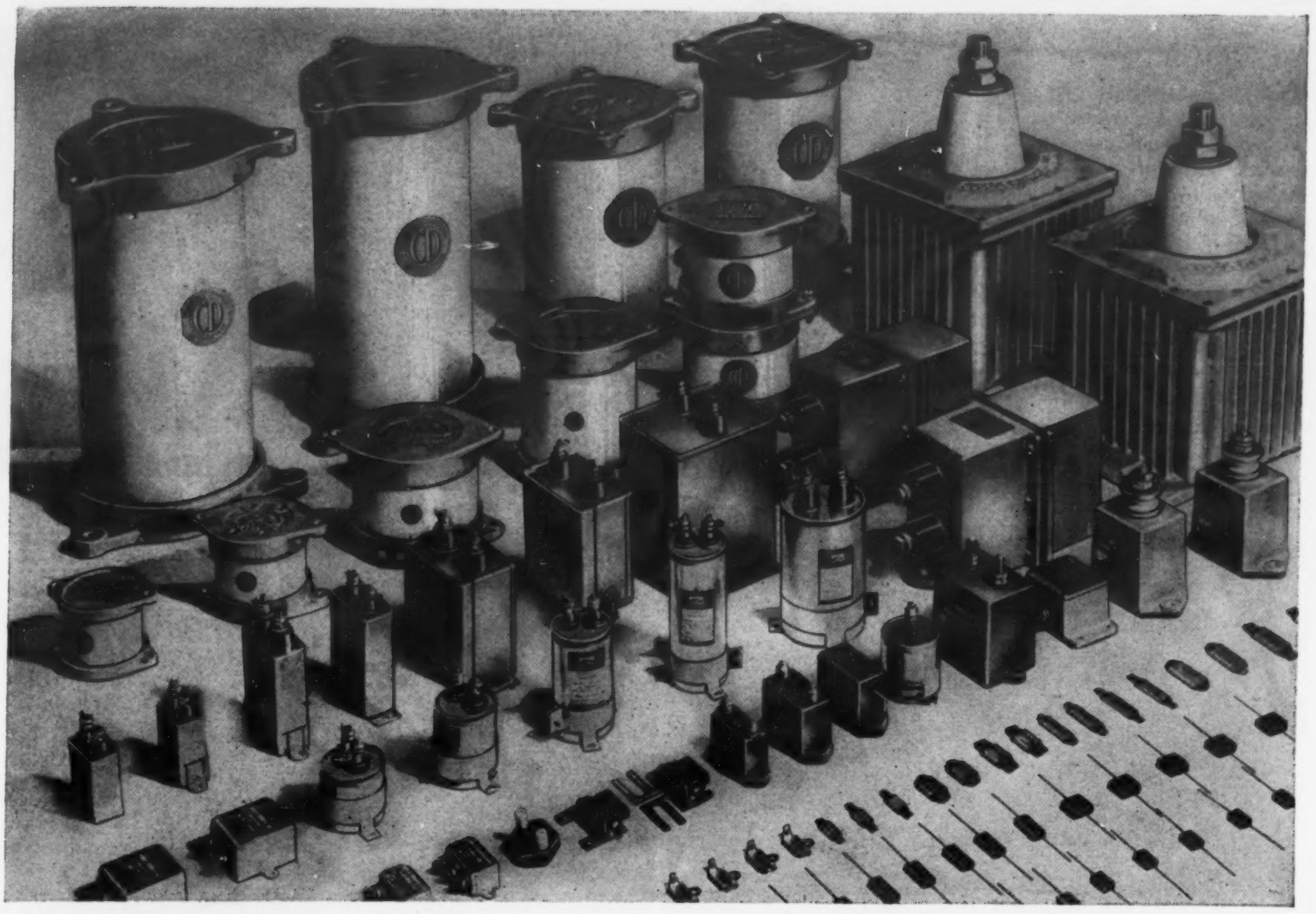
In 1937, the management looked around for greater production equipment facilities and was fortunate in being able to purchase Condenser Corporation of America which became a manufacturing subsidiary of the parent company, Cornell-Dubilier Electric Corporation. The company also found larger quarters at South Plainfield, New Jersey. The South Plainfield plant is three times as large as the Bronx plant, having, in all, 200,000 sq. ft. and the great advantage of being able to obtain water for the electrolytic capicators from Artesian wells on the property.

In the fall of 1940 it became very obvious to the management that new additions of certain types of capacitors, such as fluorescent lighting and power factor correction, had in-





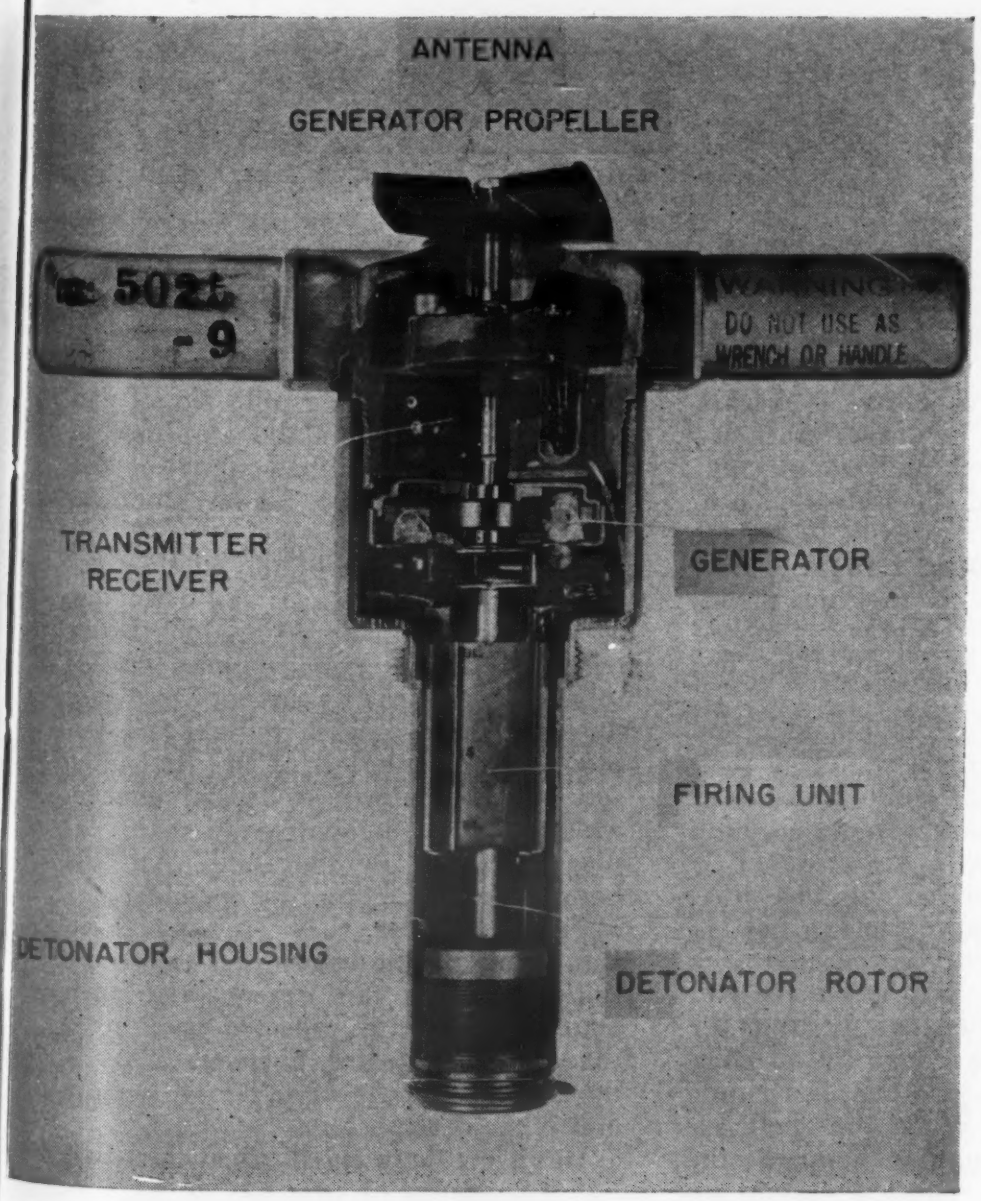
Left: Cross-sectional diagram of proximity fuze mechanism. Right view shows cutaway of completely assembled shell and parts of the fuze.



Right: An array of capacitors of standard types made by Cornell-Dubilier today.

creased the size of the unfilled orders so that it had to look for a larger plant as well as more people to work. The company, therefore, bought the Kendall Mill, formerly the Holmes Manufacturing Co., at New Bedford, Mass., containing 400,000 square feet of floor space.

In the early summer of 1942 still more space was needed to meet the demand for capacitors, and a plant at Providence, Rhode Island, was leased for mica fabrication. Similarly, additional plants also were secured in Brookline and Worcester, Massachusetts.



Several other companies and their plants have been added since the war—in Indianapolis, Indiana, a large plant consisting of 50,000 square feet of space is occupied by the Indianapolis division for the exclusive production of complete vibrators, vibrator power pack, converter and inverter lines. In Cleveland four plants of the Radiart Corporation, subsidiary of Cornell-Dubilier Electric Corporation are now used for the manufacture of television and automobile antennae, automobile vibrators, and television and FM antenna rotators. This adds up to more than one million square feet of manufacturing space in ten different plants.

Even more important than the space is what the company does with it. Today in place of the one mica condenser made some thirty years ago, some 4,000 different styles are made, for practically every electronic device uses one or more types of capacitors. After the war the new popularity of the capacitor type fractional horsepower motor for household appliances, such as refrigerators, washing machines, vacuum cleaners and the like stepped up demand. Sales of capacitors for fluorescent lights also turned out to be an important item. Another new item has been the importance of rotators and vibrators, which has led C-D to the establishment of four plants of the Radiart Corporation in Cleveland. Too, the great popularity of TV sets more recently likewise has created a great demand for the ceramic type of capacitor.

Left: Cross-sectional photo of bar-type proximity fuze which is inserted in the nose of a bomb.

However, to readers of SIGNAL undoubtedly the greatest interest is in capacitors made for military end-use — for example, more than 350 capacitors of more than 200 different specifications are used in a single large airplane. C-D's policy of pioneer development not only made it the quality peacetime products, but also proved of tremendous benefit to both the Army and Navy when the war required capacitors of a standard not believed possible. A case in point: with the advent of a global war, which required the use of thousands upon thousands plans both in arctic and tropical temperatures as well as extremely high altitudes, C-D had already designed a new type capacitor to take the place of the old, which had been found wholly inadequate for the variations in temperature and altitude.

The work of the engineering and production departments in radar equipment and under-water sound devices was truly outstanding.

Right: Effectiveness of ground shell burst and air shell burst compared. At left, foxholes and low revetments offer shielding against fragments from ground burst, while at right proximity fuze detonates bomb at proper height to spray fragments into holes and behind shielding.

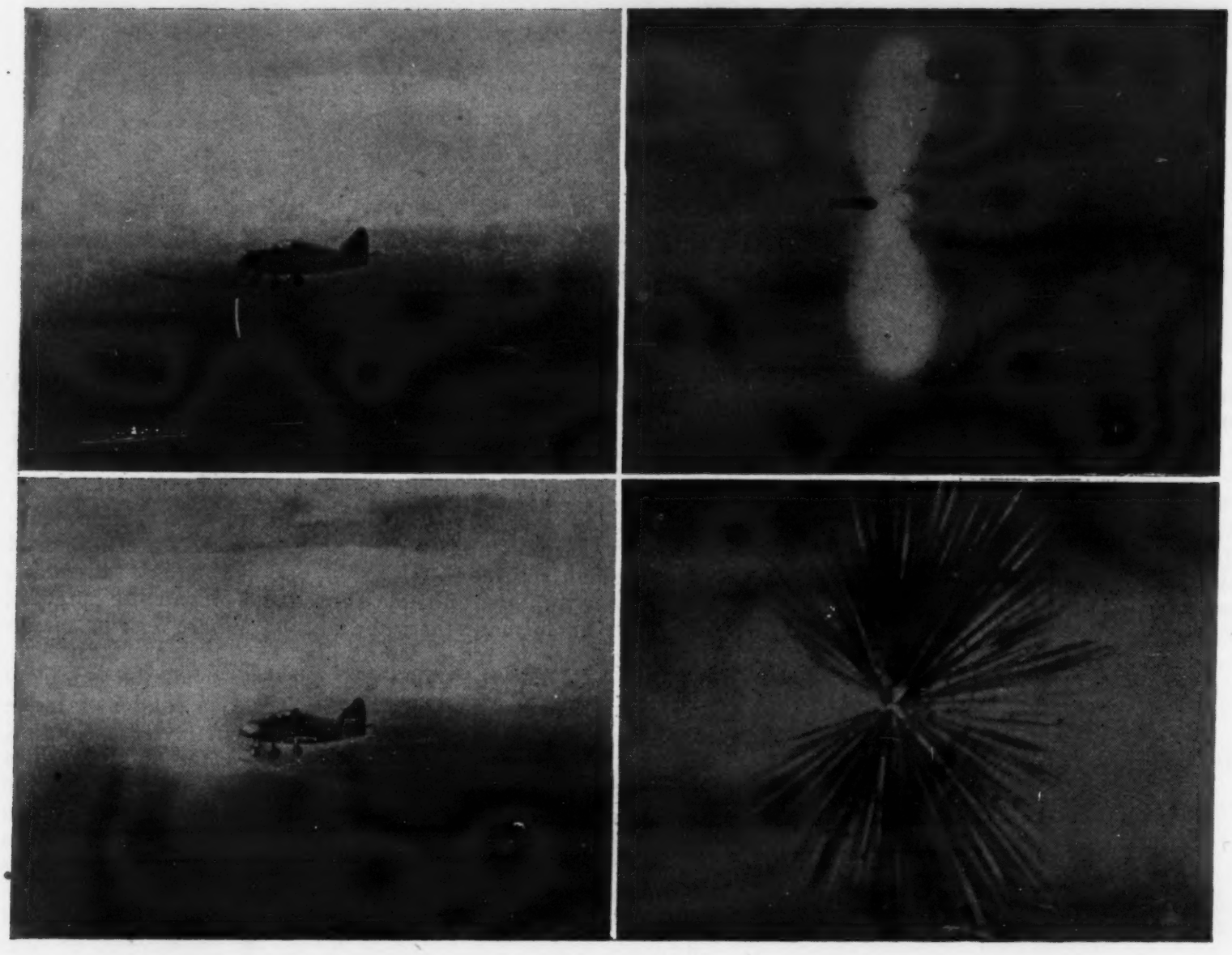


Diagram illustration showing a proximity fuzed rocket functioning on a radio controlled target airplane. Upper and lower left show rocket filled with small smoke-puff indicator substitute for high explosive, note puff at front landing wheels. At upper right artist has indicated radio sensitivity pattern, and lower right shows burst pattern of proximity fuzed rocket.

But it was with the miracle device known as the Proximity Fuze—the project A of the Navy and World War Weapon No. 2—that Cornell-Dubilier reached its greatest achievement. The development of this fuze was confined to a relatively small number of industrial concerns, and C-D played an important role in it.

Artillery experts had for years dreamed of a fuze for high explosive shells that would feel out or sense when a shell was near enough to its target to cause damage and then explode. And the Proximity Fuze was the answer to such a dream.

The older and more commonly employed fuzes were of two types. Contact fuzes exploded the shell when physical contact was made with the target, and time fuzes were set to explode the shell at a pre-determined time. Either of these fuzes was effective when firing at relatively stationary objects, but not so good when firing at rapidly moving targets such as air craft or rocket bombs. Actual hits in anti-aircraft fire were seldom obtained, and monumental difficulties presented themselves in presetting of time fuzes to explode a shell the instant it was near a rapidly moving target, even with the aid of increased directional accuracy afforded by radar control and automatic fire computers.

The Proximity Fuze eliminated time of shell flight calculations. The shell contains a miniature radio transmitter and receiver in its nose. In action, high frequency radio waves are radiated by the transmitter section of the fuze. When a target is approached, a portion of this radiated energy is reflected back to the fuze and received by the receiver section. The reflected energy from the target is out of phase with the original transmitted energy, and causes a ripple modulation of it. When the shell approaches near enough to a target, the magnitude of the reflected energy increases to where the ripple signal can be amplified by an audio amplifier in the fuze. This amplified signal is fed into a thyratron tube, which functions as a switch.

Actual detonation of the shell is accomplished by an electrical detonator or squib. The thyratron, on being triggered by the ripple signal, causes sufficient electrical current to pass through the detonator to make it explode. The explosion of the detonator sets off an auxiliary or booster charge, which in turn detonates the main explosive carried by the shell. All this happens in a fraction of a second.

There is little that is unusual in employing a radio transmitter to radiate radio waves to an object, and then employ the energy reflected back from the object for some purpose. This is the basic principle of radar, altimeters and other devices.

However, there was a great deal that

(*Continued on page* 60, *col.* 2)

RESCUE by RADIO

By Capt. C. G. Furbish

When Lt. William J. Donovan took off in his MATS C-54 from Kimpo, Korea, bound for Haneda Air Base near Tokyo, he had no idea that four hours later he would have saved the lives of three men in another aircraft six hundred miles away.

At 9,000 feet over Iwakuni Air Base on the coastal air route between southern Japan, its combat airfields, and the bustling city of Tokyo, clusters of light showing through the broken undercast marked the compact coastal towns along Japan's Inland Sea. But north over the rugged mountains and south over the Pacific all was darkness.

Pushed by a 65 knot wind from the northwest Donovan's C-54 was recording a groundspeed of 240 knots. The navigator estimated Haneda Air Base in another two hours.

In the big plane's cockpit fluorescent lights glowed softly on the instrument panel. Lieutenant Donovan in the left seat alternately glanced at the panel and ahead into the blackness. The headset pressed uncomfortably against his ears, and it was a temptation to take it off. He raised one side of the headset, rubbed his ear, then replaced the set.

Wandering B-26

At 7:46 p.m. he sent a routine position report. Then he resumed his slightly boring watch. But seconds later he heard over his headset another airplane calling him. It seemed like a routine request—to relay some information to Iwakuni—but it turned out to be more complex than that.

This call was but the first of a two-hour series of calls between the two planes which resulted in Lieutenant Donovan receiving major credit for the saving of three Air Force men and a valuable airplane.

The call was from a B-26 on a cross-country flight from Komaki Air Base to Iwakuni Air Base. The B-26 pilot had been unable to reach the Iwakuni tower on his radio, so he requested Donovan to relay the message that he was returning to his home base. Donovan did this in the way any pilot will do a favor for another; there was nothing alarming about the request.

Fifteen minutes later the same B-26 pilot asked Donovan if he was receiving the Osaka homing beacon—a radio check point between Iwakuni and Komaki. The Military Air Transport Service plane was receiving the station loud and clear. Donovan advised the B-26 of this and suggested that he call the Osaka station for a radio fix and a heading to Komaki.

Donovan listened for several minutes while the B-26 pilot tried this procedure. Osaka made no reply. Obviously the B-26 was out of voice radio range.

Donovan then advised Osaka of the B-26's attempts to reach the station. While the station stood by, Donovan had the B-26 transmit a carrier wave tone signal which can be heard farther than a voice signal. Still Osaka had no results.

Hard to Convince

It was becoming more apparent that the B-26 was lost and, further, that the plane was a considerable distance off the airway. Donovan checked again with the B-26 to determine its heading, airspeed, remaining fuel and estimated position.

The B-26 generally had been flying a 90 degree heading; had only a little over a hour of gas left and thought it was northwest of Magoya.

Donovan then advised the B-26 pilot to use maximum endurance power settings to conserve its fuel. He then called Osaka once more to advise the ground station of the plight of the lost airplane and instructed that Air Rescue Service be alerted. It was now 8:30 and the MATS plane was over Osaka.

When Donovan called the B-26 pilot once more he learned that the pilot had changed his heading from 90 degrees to 140 degrees because he still thought he was northwest of Komaki. Donovan asked the confused pilot if he realized that the wind was from the northwest at 65 knots and had probably blown him far south of course. The B-26 pilot wasn't aware of the wind but he still maintained he was north of course. Donovan, taking the situation in hand told him if he had flown the headings he claimed he had it would be impossible for him to be north of his course and instructed him to turn at once to 330 degrees and try and receive the Magoya range which is near Komaki.

Donovan then called Komaki and had them go through the same procedure as had Osaka in trying to fix the lost B-26's position by the direction of its radio transmissions. But Komaki was unable to hear transmissions from the lost plane.

In listening to the Magoya range while flying 330 degrees the B-26 pilot imagined that the range signal was growing weaker so he turned again to a heading of 180 degrees. By then Donovan's plane was halfway between Magoya and O'Shima range which marks the entry to the Tokyo area. He had not yet convinced the B-26 pilot he was south, not north, of Magoya. Then Donovan tuned in on the Miho homing beacon which is some 200 miles west of Magoya. He could hear the signal faintly so he asked the B-26 pilot to try receiving the same station. If he was anywhere near where he thought he was he should have no trouble receiving this beacon. But the B-26 pilot could hear nothing.

Whew!

That finally convinced the lost pilot that he was in the area where Donovan had predicted. The last station to try was O'Shima. It seemed nearly impossible for the plane to be nearly 200 miles east and south of his home field but fact was fact. O'Shima range was picked up by the B-26 and it came in fairly well. The pilot turned at once to a heading of 330 degrees. That, at least, would head him toward the mainland but the question now was whether his gas would last until he could land. The fuel gauges were nearly on the zero mark.

Meanwhile in the MATS C-54, Donovan had reached O'Shima range station and was circling while he called Tokyo sixty miles away to start trying for a radio or radar fix on the B-26. With their rotating direction finders Tokyo control received a very weak signal from the B-26 which placed it somewhere southeast of Tokyo. A few minutes later another stronger signal was received and through Donovan they relayed the information for the B-26 to fly 345 degrees, only 15 degrees off the course Donovan had advised. Shortly later the B-26 was picked up by Tokyo's radar screen 175 miles southeast of Tokyo.

From there on it was only a matter of sweating. Could the plane get to Haneda, the nearest airfield, before its gas ran out? It was nearly 10:00 p.m. when the B-26 finally touched down safely at Haneda and three shaken crewmen alighted. The fuel remaining in the tanks was not enough to measure. Through a combination of poor navigation and gale force winds they had been over 300 miles southeast of their destination before Lieutenant Donovan had been able to guide them to safety.

Without the helping hand from this calm, experienced pilot three men and an airplane would have disappeared at night into the Pacific ocean without leaving a trace.

ARMED FORCES COMMUNICATIONS ASSOCIATION

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COMMUNICATIONS • ELECTRONICS • PHOTOGRAPHY

Convention Underway

We have come again to AFCA convention time—a period which, in effect, marks the end of a fiscal year and the beginning of a new year for the association, since it is at the annual national meeting that reports are made on the status of the AFCA, and it is then that a new president is elected and takes office.

At this ending and beginning of the association fiscal years, we gather at a meeting place, take a look at our condition, make suggestions on improvements, and take action on such matters as we agree should be acted upon.

It is important, therefore, that every member attend the annual meetings, every year that it is possible for him to do so. Hearing the various talks made, and in talking individually with other members, he can get a clearer idea of the association goals, and he may have his thoughts stimulated to produce ideas of his own on association improvements.

Aside from the business phase of the annual meetings, it must be borne in mind that interesting and enjoyable shows are arranged for each meeting. Glance back at the displays and exhibitions of previous years—last year at Fort Monmouth where the Signal Corps had so many equipments on display, many of them brand new developments, that it took several hours of continuous moving around to see them all, and the shows, the paratroopers drop, and other displays, in the morning, and the big review at the end of the day.

The year before there was the big Navy show in Washington — the displays at the Naval Research Laboratory, the tour of the electronics-packed communications ship, and the radar-picket submarine.

The previous year we met at Dayton, Ohio, and toured the laboratories of the Air Materiel Command. There too there were fascinating communications-electronics-photography exhibits. We moved on to an area in front of the hangars and saw the latest in Air Force planes, and we wound up the day being treated to a whopping air show.

Such have been our annual meetings. Which is why for reasons of serious business, educational and enjoyable displays and exhibitions, you should attend whenever possible. We hope you make it to Chicago. At this point, looking ahead to the meeting, it promises to live up to the standard which has developed for AFCA annual conventions. In Chicago there is a heavy concentration of manufacturers in our field — communications-electronics-photography. It is being made possible for us to see much of the inner works of the plants in this field, as is indicated in the list of tours on these pages, and we know that once again the AFCA is having a meeting of thorough interest.

AFCA CONVENTION PLANT TOURS

AFCA members convening in Chicago on April 19, will be offered a unique opportunity to inspect some of the newest developments in military communications equipment, designed and manufactured by leaders in the communications and electronics field.

On Friday, April 20, there will be opportunities to visit ten industrial plants in the Chicago area. Arrangements have been made for inspection tours, each of which will afford the opportunity to spend a full day with two of the host companies which have kindly offered to open their doors to convention delegates.

The Bell and Howell Company

This company pioneered in the development of professional picture photographic equipment; later played an important role in the tremendous growth of amateur motion pictures.

The magnificent Lincolnwood labora-

tories were built in 1942. Here, during the war, men and women worked around the clock building the precision optical and electronic equipment that scientific warfare demands—lenses; gunsights; top secret radar devices; the see-in-the-dark sniper-scope; the gun cameras that photographed what the pilot shot, of the type that made the famous Navy documentary, "Fighting Lady"; bomb spotting cameras; combat cameras; and other precision equipment.

The latest addition to the company's manufacturing facilities is a huge plant for the processing of microfilm.

Sentinel Radio Corporation

The Sentinel Radio Corporation, founded in 1931, produced more than 38 million dollars' worth of equipment for the armed services during World War II.

The company has an experienced staff of engineers and technicians for production engineering and quality control. In addition to the assembly lines, the facilities of the plant include a modern, well equipped tool and die department, coil-winding department, and machine shop, which includes such basic operations as stamping, drilling, riveting, wire cutting, and mechanical assemblies.

About 80 per cent of Sentinel's present business is the manufacture of television sets; the balance is production of radio receivers.

After the close of World War II, Sentinel continued to produce small quantities of military equipment for the services and is now preparing to convert to military production such share of its facilities as may be needed.

Automatic Electric Company

The part played by Automatic Electric Company in the design and manufacture of communication equipment for military and naval uses dates back almost to the beginning of the company's history. Since prior to World War I, the armed services have made extensive use of Strowger automatic telephone equipment in army posts, arsenals, air fields, naval stations, and training camps, as well as on hundreds of naval vessels of all classes.

During World War II, the company's production of automatic telephone equipment for these and similar purposes was continued on a vastly increased scale. In addition, the company was called upon to supply a wide variety of specialized military communication equipment.

Produced at Automatic Electric also, are electrical control apparatus for industrial, engineering and public utility companies, telephone apparatus for railroads and pipe line companies, private telephone systems of all types, electrical and communication devices for aircraft and airways.

Motorola

Motorola Incorporated, today among the top four television manufacturers and unchallenged leader in the field of two-way mobile communications and car radios, began its existence as the Galvin Manufacturing Corporation in 1928 as a maker of battery eliminators. Several years later Motorola pioneered the development of the automobile radio, and since then has occupied first place in that industry.

Next followed entry into the home radio field where Motorola made a name for itself in the production of small, powerful portable radios.

During World War II, Motorola developed the famed handie-talkie and walkie-talkie two-way communication units, and received five Army-Navy "E" Awards for efficiency in meeting war contracts in the production of radar and microwave equipment.

After the war, Motorola began manufacturing television receivers and today has achieved a foremost position in the industry.

Hallicrafters Co.

Hallicrafters main plant is a block-long, rectangular building located on the west side of Chicago. The building was specifically designed for Hallicrafters to be the most modern and best equipped medium-sized radio plant in the country. This plant was designed with emphasis on flexibility of production.

A complete production line of up to 130 people can be changed over from one type chassis to an entirely different type, position by position, with less than one minute's delay between the last unit of the production run and the first unit of the next. In this building are produced television receivers, all-wave communications receivers and transmitters, and also government contract electronic products.

The tour will cover all phase of Hallicrafters manufacturing. An adequate staff of guides will be available so each group can be assured personal attention in regard to special questions concerning the Company's operation.

Teletype Corporation

Since 1906, the Teletype Corporation has been the leading manufacturer of printing telegraph and associated apparatus.

A subsidiary of the Western Electric Company, it supplies equipment for the armed forces and other government agencies, commercial communications companies, news disseminating organizations, railroads, pipe lines, and many other users of printed communications the world over.

A tour of the manufacturing plant shows the visitor how the many parts are made and assembled into the product.

Rauland Corporation

An opportunity to visit one of the world's most modern mass production plants devoted to the manufacture of television picture tubes and other cathode ray and high vacuum devices.

The Rauland Corporation, one of the early pioneers in the field of television picture tube manufacture, operates one of the outstanding plants in the United States for production of picture tubes. The plant is highly mechanized with practically every operation being performed by intricate special machinery, developed specifically for the purpose.

All the phases of the operation will be shown, including every branch of tube technology. A visit to this plant, in which a complete picture tube can

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COST PER PERSON: All inclusive* for April 19/20—$18.50
April 19—Registration and Luncheon $6.00 (No charge for Forum.)
April 20—Registration and Banquet $10.50
April 20—Registration, Luncheon, Plant Tours & Banquet $13.50

*Except for Dutch Treat Dinner on April 19 and/or Destroyer trip and luncheon on April 21.

FIFTH ANNUAL CONVENTION

Convention Chairman, A. F. Lang
3rd Floor
1033 West Van Buren Street
Chicago 7, Illinois

PROGRAM:

APRIL 19

TIME	EVENT
0900	Registration opens, Drake Hotel, Chicago
1000 to 1200	Council and Directors' Meeting
1230	Keynote luncheon, Principal Speaker — Leslie Muter. Welcome by Theodore S. Gary, National President, and Oliver Read, Chicago Chapter President.
1400	Chapter Presidents' Meeting
1430 to 1630	Forums Landlines — Moderator, James H. Kellogg. Radio Communications—William Halligan, Sr. Photography—William DeVry
1730	Reception and Cocktails
1900	Dutch Treat Dinner (optional)
2000	Entertainments (will be detailed later)

APRIL 20 — PLANT TOURS:

Tour No. 1—Bell & Howell Co. and Sentinel Radio Co.
Tour No. 2—Automatic Electric Co. and Motorola, Inc.
Tour No. 3—Teletype Corp. and Rauland Corp.
Tour No. 4—Western Electric Co. and Webster-Chicago Corp.
Tour No. 5—Hallicrafters, Inc., and State Civil Defense Control Center and Filter Center Ground Observer Corps.

Luncheon included in all above tours.

1800 Cocktail Party—Chicago AFCA Group Members as Hosts.
1930 AFCA Convention Banquet and Entertainment. Principal Speaker, Robert C. Sprague.

APRIL 21—Inspection Trip aboard U. S. Naval Destroyer Escort *Daniel A. Joy*.

AFCA GROUP MEMBERS

Communications—Electronics—Photography

Listed below are the names of the American firms who are group members of the Armed Forces Communications Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation in our special fields.

Acme Telectronix
American Cable & Radio Corp.
American Institute of Electrical Engineers
American Phenolic Corporation
American Radio Institute, Inc.
American Radio Relay League
American Steel & Wire Company
American Telephone & Telegraph Co.
Anaconda Wire & Cable Company
Argus Cameras, Inc.
Arnold Engineering Company
Astatic Corporation
Automatic Electric Company
Automatic Electric Sales Corp.

Baltimore News Post
Barry Corporation, The
Bell Telephone Company of Pa.
Bendix Radio
Bliley Electric Company
Breeze Corporation, Inc.
Burnell & Company

California Water & Telephone Co.
Capitol Radio Engineering Inst., Inc.
Carolina Telephone & Telegraph Co.
Central Radio and Television Schools
Chesapeake & Potomac Tel. Co.
Cincinnati & Suburban Bell Tel. Co.
Collins Radio Company
Columbus Process Co., Inc.
Copperweld Steel Company
Cornell-Dubilier Electric Corp.
Corning Glass Works
Coyne Electric School, Inc.

Da-Lite Screen Co., Inc.
Diamond State Telephone Co.
DuMont, Allen B, Laboratories, Inc.

Eastman Kodak Company
Eby, Inc., Hugh H.
Electronic Associates, Inc.
Electronic Research, Inc.
Espey Manufacturing Co., Inc.

Federal Mfg. and Engineering Corp.
Federal Telephone & Radio Corp.

General Aniline & Film Corp.
General Cable Corporation
General Electric Company
General Instrument Corp.
General Telephone Corp.
Gilfillan Bros., Inc.
Graflex, Inc.
Gray Manufacturing Co.

Hallicrafters Company
Haloid Company
Hazeltine Electronics Corp.
Heinemann Electric Company
Hercules Motors Corp.
Hoffman Radio Corp.

Ilex Optical Co.
Illinois Bell Telephone Co.
Indiana Bell Telephone Co.
Indiana Steel & Wire Co.
Institute of Radio Engineers
International Resistance Co.
International Tel. & Tel. Corp.

Jacobsen Manufacturing Co.

Kellogg Switchboard & Supply Co.
Kleinschmidt Laboratories, Inc.

Lavoie Laboratories
Leich Sales Corporation
Lenkurt Electric Company, Inc.
Lewyt Corporation
Loral Electronics Corporation

Machlett Laboratories, Inc.
Magnavox Company
Mallory & Co., Inc., P.R.
Martin, Glenn L., Company
Merit Transformer Corp.
Michigan Bell Telephone Company
Motorola, Inc.
Mountain States Tel. & Tel. Co.

National Carbon Company, Inc.
National Company, Inc.
New England Tel. & Tel. Co.
New Jersey Bell Telephone Company
New York Telephone Company
Northwestern Bell Telephone Co.

Oak Manufacturing Co.
Ohio Bell Telephone Co.
O'Keefe & Merritt Company
Operadio Manufacturing Company

Pacific Telephone & Telegraph Co.
Philco Corporation
Photographic Society of America
Precision Apparatus Co., Inc.

Radiart Corporation
Radio Condenser Company
Radio Corporation of America
RCA Victor Division
Ray-O-Vac Company
Raytheon Manufacturing Company
Reeves Instrument Corp.
Remington Rand, Inc.

Saxonburg Potteries
Sherron Electronics Co.
Simmon Brothers, Inc.
Smuckler & Company, Inc., A. F.
Society of Motion Picture Engineers
Sonotone Corporation
Southern Bell Tel. & Tel. Co.
Southern New England Tel. Co.
Southwestern Bell Telephone Co.
Sperry Gyroscope Company
Stackpole Carbon Company
Stupakoff Ceramic & Mfg. Co.
Sylvania Electric Products, Inc.

Telephone Services, Inc.
Telephonics Corporation
Teletype Corporation
Times Facsimile Corporation
Transmitter Equipment Mfg. Co.
Tung-Sol Lamp Works, Inc.

United Radio Television Institute
United States Rubber Company
United Telephone Co.

West Coast Telephone Co.
Western Electric Company, Inc.
Western Union Telegraph Co.
Westinghouse Electric Corp.
Weston Electrical Instrument Corp.
Willard Storage Battery Company
Wisconsin Telephone Company
Wollensak Optical Company

be produced every twenty seconds, is most interesting and constructive.

Western Electric Company

In the Chicago area, the Hawthorne plant is the largest of many Western Electric Company manufacturing locations, with a land area of over 200 acres, and personnel numbering over 18,000 people. The Western Electric Company functions as a manufacturer, purchaser, distributor and installer of the communications network, that is, the Bell Telephone System. At Hawthorne one may see the construction of large automatic switching frames and the manufacture of wire and cable drawn from copper bars. The latter area will be included in the tour.

Webster-Chicago Corp.

This firm, organized in 1914, is a manufacturer in the true sense of the word, since most parts and components used in the products are fabricated within its own plant. Also, Webster-Chicago is unique as a manufacturer, being not only a leading processor of sheet steel, production tools and equipment, but electronic products as well, all finally assembled by Webster-Chicago into finished goods of their own manufacture.

During World Wars I and II, Webster-Chicago produced precision parts for aerial cameras, field telescopes, ordnance gauges, dynamotors, voltage regulators, magnetic recorders, parts for radar equipment and arming devices for bombs. For this government production, Webster-Chicago was awarded the Army-Navy "E".

State Civil Defense Control Center—Filter Center Ground Observer Corp.

This trip will take visitors along Chicago's lake front to the famed Museum of Science and Industry in Jackson Park, where the State civil defense and filter center will be viewed. The filter center correlates reports from merely 400 spotting posts in four midwestern states. With information plotted and filtered, it is passed on to the proper radar identification center. At this point, radar and ground observing information is evaluated and relayed to another point, an air defense control center. There a control officer, from the information thus accumulated, takes appropriate measures to meet the situation presented.

A timely review of civil defense problems will be given.

U. S. Naval Escort Destroyer Trip, Saturday, April 21

Arrangements have been made for those who desire to stay over in Chicago on Saturday morning to make an inspection trip aboard the *Daniel A. Joy*. This ship, the largest combat vessel on the Great Lakes, is a fully equipped U. S. Navy Destroyer escort.

Guests will be afforded a demonstration of communication activities including Radar and Sonar operations.

We can do it again —BETTER!

Crosley is keenly aware of its responsibility to the national defense program. We regard it as an opportunity to place our full resources at the disposal of the military.

In particular, we would welcome the opportunity to participate in electronic projects that will challenge our ingenuity and resourcefulness as did the proximity fuse during World War II.

First to get into production on the fuse, we're proud of the commendation we received for our part in its development and in manufacturing its most intricate designs. Crosley's contribution to the development of the Mark XIV gun sight also won high praise from the services.

As the largest manufacturing division of AVCO Manufacturing Corporation, with its tremendously expanded personnel and production facilities, Crosley is far better prepared to serve you today than it was in the wartime years.

Our electronic scientists, designers, and engineers have kept well in the lead in technical advancement. We have added thousands of trained television and radio workers to our production forces. Our plants (with 3,300,000 square feet of floor space) are equipped with the most modern automatic machinery and materials handling systems.

A word from you will bring our immediate cooperation on any electronic problem or project on which we can be helpful, in any way.

CROSLEY DIVISION
AVCO MANUFACTURING CORPORATION

1329 Arlington Street AVCO MANUFACTURING CORPORATION **Cincinnati 25, Ohio**

CHAPTER NEWS

Augusta-Camp Gordon

Dr. J. O. Perrine, assistant vice- president of the American Telephone and Telegraph Company, presented his demonstration-lecture "More Words—More Waves—Less Wires" before the chapter's January 10th meeting.

More than six hundred people attended as guests of the chapter and for over an hour and a half were held spell-bound by Dr. Perrine's fascinating program.

Prior to the lecture, chapter members attended a dinner-meeting at the Camp Gordon officers' club. Guests included Brig. General and Mrs. Halley G. Maddox, commanding general, Camp Gordon; Col. James H. Howe, chief of staff, Camp Gordon; Col. Francis E. Howard, commandant, Provost Marshal General School, Camp Gordon; William H. Mansfield, AFCA national director; and Ralph Grist, president of AFCA's Atlanta Chapter.

and radio. The voice frequencies were described and compared with the tone frequencies occuring in a symphony. By viewing the wave patterns on the oscilloscope, it was clearly shown that vowel wave patterns differ with each individual while consonant sounds give the same wave pattern regardless of how many different individuals speak them.

The next phase of the demonstration was the superimposition of modulated waves on carrier signals. First, each of four different conversations were fed through the wires and heard at the other end. Then the four conversations were fed together and the jumbled conversations heard on the other end. By use of the RF signal generator, four carrier signals were transmitted and each viewed on the oscilloscope, emphasis being placed on the sine wave effect. Then, one at a time, a modulated wave was superimposed on the carrier signal and transmitted. After all four conversations were combined with each of the four carrier signals, they were viewed and heard. Following this, all four modulated carrier waves were transmitted and heard at the other end. And then, one by one, the carrier signals were removed leaving the original conversation.

The role of photography as a communication device was developed in a lecture on "Functional Photography" by Adrian L. Terlouw, superintendent of Camera Club & School Service of the Eastman Kodak Company, at the Baltimore Chapter's February 14th meeting.

With the assistance of Eastman Kodak's excellent technical movie, Mr. Terlouw explained how photography, through reproduction and enlargement of documents, actually was a medium of visual communication. The movie showed how micro-films of varied sizes of documents, including letters, blueprints, cards, etc., could be made and stored for indefinite periods of time. The speaker pointed up the accuracy with which this documentary evidence is maintained in that an actual duplicate of the entire transaction is filed and readily available at all times to anyone desirous of using it. As an example, it was shown how this type of communication could be of value in the construction field where a group of engineers are called in for a conference. Instead of having reams of large blueprints for reference, the engineers review the microfilm through an enlarger on a screen.

Mr. Terlouw was no newcomer to the Baltimore area inasmuch as he had been a graduate student at Johns

Chapter of the Year, 1950

AUGUSTA-CAMP GORDON

President—Henry J. Hort
Past Pres.—Hugh Fleming
Secretary—P. K. Jones

1951 Contest Chapter of the Year

On February 28th, with only one month to go, the leading chapters were:

Sacramento	**20.3 points**
Seattle	**17.8**
Boston	**17.0**
Pittsburgh	**16.7**
Philadelphia	**16.7**
San Francisco	**15.7**
New York	**15.5**
Cleveland	**13.9**
Washington	**13.9**
Augusta-Camp Gordon	**13.8**

This year, as a result of increased chapter activities, the contest has turned out to be a very close one and there are sure to be marked changes in the above line-up when the contest ends on March 31st. Even as *Signal* went to press, Pittsburgh sent in 41 new memberships (not counted in figures above) which will give it several additional points.

AFCA European Chapter meeting. L:R Col. A. T. Wilson, USAFE communications; Lt. Col. I. Doctor, chapter pres.; G. A. Spear, chapter v.p.; Brig. Gen. R. V. D. Corput, EUCOM chief signal officer; R. R. Aldridge, chapter treas.; Chase Laurendine, chapter exec. secty.; Lt. Cmdr. J. Kilborn, USN, communications officer, U. S. Naval Forces, Europe; Col. R. G. Richon, deputy CSO, EUCOM.

Baltimore

On January 18th, Dr. Perrine appeared in Baltimore under the joint sponsorship of the AFCA Baltimore Chapter and the Engineers Club of Baltimore and its affiliated societies. The meeting attracted an audience of over 1,700 persons.

In his opening remarks, Dr. Perrine likened the engineer to "energy" and concluded his theorizing with the development and derivation of the term "engineering" as applied to these individuals engaged in engineering and research who are interested in the development of new ideas and gadgets for increased production.

Dr. Perrine, in layman's language, described the equipment used in his demonstration, namely, the signal generator, the oscilloscope, transmitters and receivers, and showed how each played its part in the transmitting of conversations between locations via wire

AFCA European Chapter luncheon, Heidelberg, Germany.

Hopkins University where he worked in experimental psychology in addition to the field of cytology and genetics. His graduate work was terminated by an appointment at the Rockefeller Institute of Medical Research. Later he joined the sales staff of the Eastman Kodak Company as an expert in medical and scientific photography. During the last nine years he has been associated with the Camera Club and School Service of Eastman Kodak which supplies lecture material to Camera Clubs and teachers of photography.

The meeting took place in the Lansdowne Plant of the Westinghouse Electric Corporation, with dinner served in the plant cafeteria.

Following the lecture, guides conducted the ninety-three chapter members and guests on a tour of the plant, pointing out the highlights of the manufactured products being made in the electronics division of Westinghouse. These included such well-known items as R. F. induction equipment, broadcast transmitters, etc.

Boston

Moving up to New England, Dr. Perrine gave his lecture in Boston on February 20th under the auspices of the AFCA Boston Chapter, the Engineering Societies of New England, Northeastern University and the New England Telephone and Telegraph Company.

This was Dr. Perrine's first appearance in Boston and the Alumni Auditorium of Northeastern University, the place of the meeting, was filled to capacity with more than 700 present. Earlier in the day, Dr. Perrine presented his program before a meeting of the student body of Northeastern University.

Chicago

The Coyne Electrical and Radio-Television School was host to the chapter for its January meeting. After dinner at the nearby Medical Center YMCA, the members convened at one of the Coyne lecture halls for the evening program which was followed by a tour of the school while in session.

Chapter President Ollie Read opened the meeting with a report on the plans of the fifth annual convention of the AFCA which is being held in Chicago on April 19th-21st.

Raymond K. Fried, chapter secretary and legal consultant on procurement, was asked to give the members a brief resume of his recent experiences with the procurement and industrial mobilization offices in Philadelphia. Col. Fried advised the members representing small businesses and new businesses that patience in seeking government business would probably be rewarded by April or May, with contracts for those who convert to military production. The services and agencies are going forward with plans that naturally

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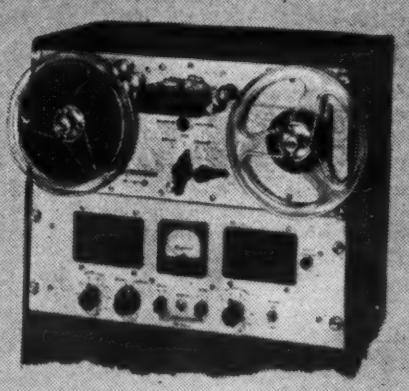

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PURDUE UNIVERSITY, **Will receive charter at AFCA annual convention in Chicago.**

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UNIVERSITY OF ILLINOIS, **Will receive charter at Chicago convention.**

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National Headquarters Chapters Secretary: Julia B. Godfrey

CHAPTER NEWS

make first use of the known government suppliers of World War II who have been willing and able to maintain paid staffs specializing in maintaining and developing government supplies in the fields of communications and photography. Fried advised members interested in manufacture for the Signal Corps that Philadelphia is the location where contract details must be worked out, and not in Washington.

President Read next introduced the principal speaker of the evening, Mr. D. B. Miller, educational director of the Coyne School, who spoke on "The Value of Technical Training in the Armed Forces," as a civilian observer. Mr. Miller sketched the rapid growth of technical skills required in the armed services, starting with the relatively modest requirements of World War I days, when the telephone, wireless telegraphy, automobile and aircraft were just beginning to become significant parts of the military machine. He cited some of the problems of World War II, when service schools were rapidly expanded to train men for technical assignments in aviation, radio, and radar, and it was found necessary to call on public and private schools to supplement the technical training facilities.

Mr. Miller stated that while the number of trained technicians now serving in the armed services is withheld from publication for reasons of military policy, it is known that the total already exceeds that of the peak period of World War II. The trend of modern warfare, in Korea and at outposts in sixteen other foreign countries, places increasing dependence on the installation, maintenance and repair of electrical communications equipment in greater volume than ever before. A large part of Coyne's problem in World War II and in the present situation is to train men in the fundamentals of electricity, land-line and radio communications who will be available technicians for the specialized training of the armed services.

Mr. Miller outlined the pattern of training at Coyne which comprises about fifty per cent classroom instruction and fifty per cent shop work. Classroom instruction consists of lectures,

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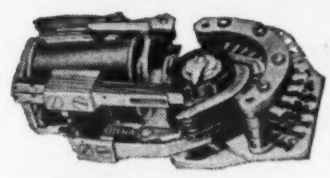
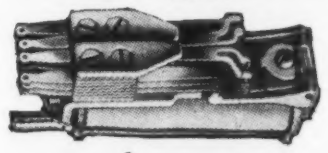
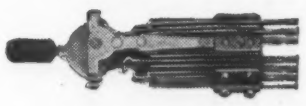


Stepping Switches



Relays

Turn Keys



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demonstrations, discussion periods, and the use of visual aids, cut-away models, and manuals of work to be completed under the guidance of instructors. In the visual aid category are slide films, with and without sound, and an estimated seven miles of sound motion picture film subjects. The shop work is done on real equipment, supplemented with specially constructed training aids. Students become familiar with all forms of electrical devices and actually construct, operate and trouble-shoot radio and television receivers and radio transmitters. Mr. Miller concluded his talk by showing a sound slide film of industrial application of electronics, designed to acquaint the student with the varied possibilities in that field.

As the night school was then in session, the AFCA members were conducted on a tour of the classroom and laboratories of Coyne to observe the instruction and equipment. Newest feature of the training is a small but modern television transmitter and studio that is in process of completion.

After the tour, the group assembled in a lecture theatre to view a timely U.S. Army Signal Corps film, "Guarding Against Sabotage," made available through the courtesy of the signal officer, Fifth Army.

Cleveland

The Eastman-Kodak film "Functional Photography in Industry" was featured on the program of the chapter's February 8th meeting. The chapter reports the film was very well received by the group of members who braved one of the most inclement evenings of the winter.

The film, which has made available to all chapters by the Eastman-Kodak company, an AFCA group member, has already been used by a number of other chapters with much success.

Decatur

Committees were appointed and a new secretary-treasurer elected at a meeting of the officers and directors of the chapter on January 22nd.

O. D. Allinson was named secretary-treasure to succeed Willard Hayward who had resigned due to the pressure of other duties. Lt. Col. Jack Nahas and Elmer Cupp were appointed to the program committee; Lt. Col. A. W. Hazuda and David Richardson to the membership committee; and Capt. T. A. Mulcahy in charge of publicity.

A membership drive was set in motion and plans were made to highlight civil defense at the next chapter meeting.

An over-all picture of civil defense plans for the Decature area was presented to the chapter by Col. Lutz W. Krigbaum, USA(Ret.) at its February 21st meeting.

Col. Krigbaum, who is the local civil defense director, described the organization which has been established to function in the event of an emergency and pointed out that it was designed principally to render control, administer to the wounded, and establish emergency measures to provide water, light and other utilities. He stated that several hundred persons in Decatur had already been designated to assist in the program and that plans for its efficient operation were rapidly going ahead.

Following Col. Krigbaum's talk, the film "Battle of Britain" was shown to emphasize what could be expected in the event Decatur became a target and was bombed.

Detroit

A complete coverage of the color TV question was presented to the February 2nd meeting of the Greater Detroit Chapter by Mr. Oscar Kusisto, prominent radio and television engineer from Motorola, Inc. His talk included a description and evaluation of the various color systems, the possibility of converting present sets for color reception, and the economic factors influencing the question.

The meeting, held at the new Veterans Memorial Building, was presided over by Chapter President E. C. Balch, chief engineer of the Michigan Bell Telephone Company, and was attended by one hundred members and guests.

Two Signal Corps films covering the Korean situation through October 1950 —"Battle for Time" and "Turning the Tide"—concluded the program.

European

Having found evening meetings impractical, the European Chapter has inaugurated a series of monthly luncheon meetings at alternating locations. The first of such meetings was held at the Casino Club in Campbell Barracks, Heidelberg, on January 31st. Brig. General Rex V. D. Corput, chief signal officer of the European Command, was guest of honor and gave an interesting talk on communication problems in Korea.

Among those present were: Col. Albert T. Wilson, USAFE Communications; Lt. Col. Ira P. Doctor, president of the European Chapter; Lt. Comdr. Jesse Kilborn, communications officer, U. S. Naval Forces, Europe; Col. G. L. Richon, deputy chief signal officer, EUCOM; Chase E. Lurendine, chapter secretary; George A. Spear, vice president; and R. R. Aldridge, treasurer.

Included on the program of chapter activities for the year is the award of AFCA medals to the honor students of the Signal Corps School at Ansbach.

Fort Monmouth

"More entertainment, more education, more members" are the "Big-Three" 1951 goals of the Fort Monmouth Chapter according to a recent announcement by Col. E. A. Kenny, chapter president.

"Although our membership rose steadily during 1950, we're frankly out to get even more new members," Colonel Kenny said. "We have a splendid, live organization, our present members are active and enthusiastic, and we want as many more of our Fort Monmouth co-workers as possible to reap the benefits of membership and help to make our chapter a leading unit of the national association. To attract and hold those new members, we're planning a 1951 program that will even surpass last year's—which members found interesting and enjoyable."

At least four chapter meetings will be held during the year, each one featuring widely known speakers and well planned entertainment. Highlighting the summer social program will be a beach party, free to members and their families.

Colonel Kenney emphasized that membership in AFCA is still open to anyone interested in the fields of communications, electronics and photography—enlisted personnel, WACs, officers, and civilians employed in or outside Fort Monmouth. To acquaint as many persons as possible with AFCA aims and purposes, the chapter plans to place posters through the Post and in surrounding commities.

Gulf Coast

The official petition for chapter for the new Gulf Coast Chapter of the AFCA was received at headquarters and approved as SIGNAL went to press.

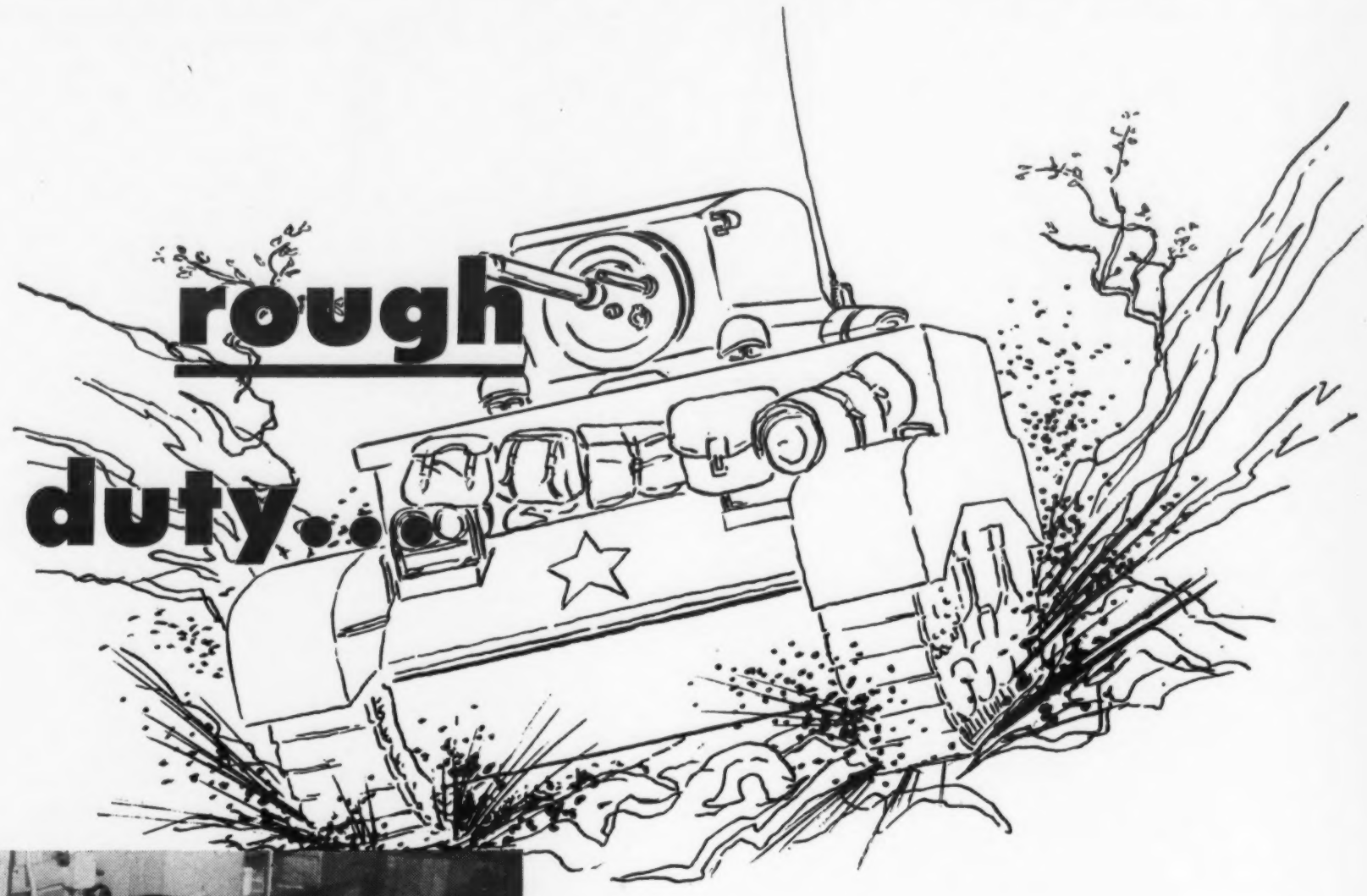
Organized through the efforts of Col. John A. McDavid of Kessler Air Force Base and Justin A. Courtenay of the Southern Bell Telephone & Telegraph Co., Jackson, Miss., the chapter has an initial membership of forty-seven made up of personnel from Kessler Air Force Base, the Southern Bell T&T Co., etc.

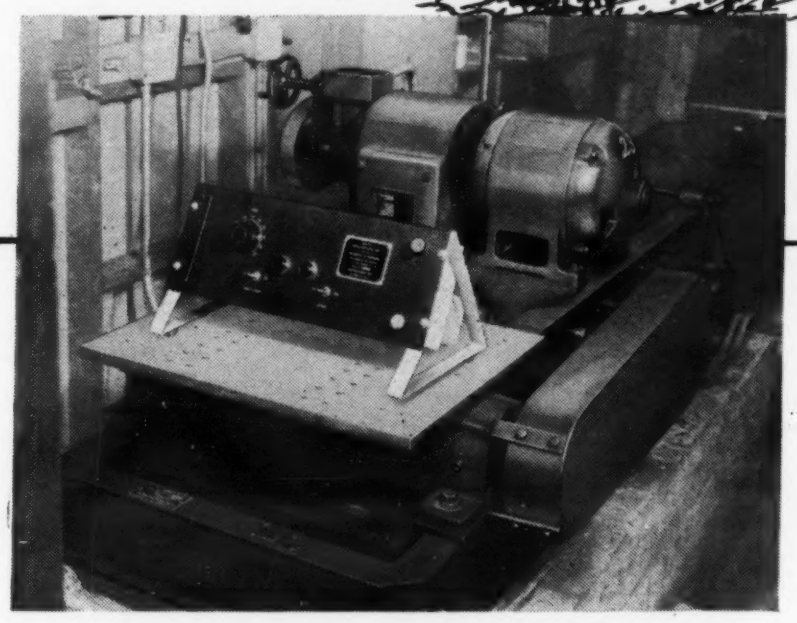
At the organizational meeting on March 5th, the following officers were elected to head the chapter during its first year: president—Col. John A. McDavid; 1st vice-president—Justin A. Courtenay; 2nd vice- president—Lt. Col. Edwin L. Wood; secretary—Lt. Col. Francis R. Delaney; treasurer—Curtis W. Hollister.

New York

A round-table discussion on "Communications Resources of the Free World," with Vice Admiral W. S. Anderson of International Automatic Electric, Maj. General H. C. Ingles of RCA Communications, and Brig. General A. W. Mazziner of International Telephone & Telegraph Corporation as the speakers, featured New York's January 31st meeting at the 71st Regiment Armory.

Chapter President Ellery W. Stone





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announced the election by the board of directors of Col. Bernard W. Wootton, USAF, as vice-president of the chapter to fill the vacancy caused by the transfer of Col. H. H. Yeager to Colorado. The following members were elected to represent the chapter on the National Council at the annual convention in Chicago: Vice Adm. W. S. Anderson, George W. Bailey, Col. T. L. Bartlett, Maj. Gen. H. C. Ingles, Brig. Gen. A. W. Marriner, D. J. S. Merton, F. E. Munich, Rear Adm. S. F. Patten, Maj. T. N. Pope and H. J. Schroll. The chapter is entitled to eight representatives on the Council, and Messrs. Merton and Munich will serve as alternates.

Committee chairmen were appointed for the year 1951 as follows: armed forces—Commodore J. S. Baylis; industrial relations—Dr. Orestes H. Caldwell; liaison—George W. Bailey; meetings—Col. T. L. Bartlett; membership—Royal F. Jewett; financial Col. W. L. Hallahan; publicity—Thomas O. Woolf; reserve affairs—Lt. Col. Ludwig R. Engler; civil defense—Brig. Gen. A. W. Marriner.

Three distinguished visitors were introduced to the gathering by Admiral Stone: Maj. Gen. Frank. E. Stoner, communications consultant to the United Nations; Ernest Robinson, senior vice-president of the Fairchild Camera and Instrument Company; and Col. A. D. Reutershan, commanding officer of the 71st Regiment, New York National Guard.

Philadelphia

More than twenty members of the Philadelphia Chapter participated in the highly publicized mock air raid on Camden, N. J., on January 11th. Without question the most efficiently handled aspect of the raid was the communications. In contact by radio with twenty planes, nearly one hundred automobiles, and even a pack job, the communications plan called for the complete disruption of telephones and radio by the reprecussions of the bomb. While the emergency net was put into operation (it took less than five minutes the exact location of the bomb hit was relayed to the communications center by Boy and Sea Scout wig-waggers. Temporary telephone lines from the fourth floor desk of the city director permitted over-all control through the mobile control center on the ground.

Chief credit for the exemplary work of the two hundred persons serving communciations is due to Col. Robert Pearson, who heads up the chapter's committee on Camden's civil defense communications.

The first public showing of a new type electronic brain developed by the Franklin Institute Laboratories for Research and Development highlighted the Chapter's February 8th meeting

Above: Shown at first regular meeting of new Rochester Chapter are, left, V. Stanley Cronin, photographic section, industrial planning division, Air Force; and Joseph C. Wilson, president of the Haloid Company and president of the Rochester Chapter.

at the Franklin Institute. Known as the Advanced Time Scale Analog Computer, the instrument is an electronic model of complicated mechanical devices such as automatic machinery used in manufacturing and process industries. Solving differential equations which are involved in the design of these types of automatic machinery, use of this computer will eliminate former laborious methods of calculating with resultant savings of time and money.

Other recent developments of the institute's research labs were outlined by Mr. R. H. McClarren, assistant to the institute's executive vice president, after which a special planetarium demonstration was given by Dr. I. M. Levitt, director of the Fels Planetarium, on cloud-seeking experiments and weather. A visit to the observatory, where telescopic views were seen and explained, concluded the evening's program.

One hundred and sixty-nine members and guests turned out for the meeting, which was preceded by cocktails, dinner, and a tour of some of the many varied and interesting exhibits in the Franklin Institute.

Pittsburgh

With great resourcefulness, the Pittsburgh Chapter was able to put on a most successful dinner meeting on January 23rd despite the eleventh hour cancellation of its scheduled program.

Col. Arthur Pulsifer, chief of personnel and training, Office of the Chief Signal Officer, Washington, who had been scheduled as the main speaker, became ill the morning of the meeting and was unable to attend. When word of his illness was received at noon the task of revamping the program was given to Lt. Col. Richard W. Waters, a chapter member who obviously must be known for his ingenuity, as he produced five interesting speakers: Col. G. V. Sottong, commanding officer, Hqs. Western Pennsylvania Sub-District Detachment # 51 ASU; Capt. Morgan C. Barrett, USN, supervising inspector of Naval Material; Maj. D. H. Paap, base director of material and supply, 71st Fighter Interceptor Squadron, Greater Pittsburgh Airport; William J. McIllvane, vice president, Copperweld Steel Company; and Edward J. Priddey, public relations manager, Gimbel Brothers, and chairman of the military advisory committee.

Each of the speakers reviewed his mission to the local area, and a very enlightening talk was given by Mr. Priddey on how his job fit into the over-all defense plan. The chapter reports it was one of the most interesting meetings it has held. However, Col. Waters, to whom much credit goes for the success of the meeting, is now lost to the chapter for further emergencies since he has been transferred to the personnel and training division, Office of the Chief Signal Officer, Washington.

The meeting was held at the Fort Pitt Hotel and was preceded by a social hour. Seventy-five members and guests were present.

Rochester

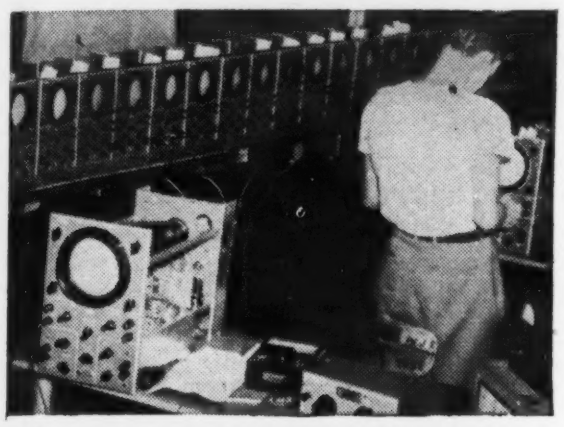
Addresses by V. Stanley Cronin, representing the photographic section of the Air Force's industrial planning section at Wright-Patterson Field, and Major Richard Ames, chief of the Air Materiel Command's Rochester area office, and the election of chapter officers marked the first regular business meeting of the newly organized Rochester Chapter in mid-February.

First president of the new chapter is Joseph C. Wilson, president of The Haloid Company. Other officers elected at the meeting were: vice presidents, John Whittle, Eastman Kodak Company; Norman Kuegler, Wollensak Optical Company; and Dr. Alfred Schwarz, Ilex Optical Company; secretary, Robert Bowie, Eastman Kodak; treasurer, George Lawrence, Bausch & Lomb Optical Company. Mr. Whittle was selected chairman of the membership committee, and Mr. Lawrence chairman of the program committee.

Mr. Cronin, in his talk before the chapter, predicted that the photographic industries will be in peak production much sooner than previously expected, emphasizing that the armed forces need heavy production of many newly-developed items. Contracts for these items will be let just as soon as Congress makes funds available, he said. The Air Forces procurement division, Mr. Cronin told the chapter members, will directly aid industries in getting priorites on personnel, materials and facilities, including machine tools and factory space.

Smaller companies, the Air Force photographic representative said, who are concerned with their employment situation, will not have as long a wait in the shift as many had anticipated. Production for civilian needs, Cronin

Dallas telestation KBTV uses this Du Mont Telecruiser—a complete television studio on wheels and beyond question television's most advanced vehicle for field operations.



A number of Du Mont Cathode Ray Oscillographs moving through test position after production in the Clifton Plant. Du Mont is the world's largest manufacturer of this type of scientific equipment.

Du Mont quality is insured by a rigorous program of testing and inspection. Here a highly trained Du Mont inspector is performing an exacting check on a receiver chassis in the East Paterson Plant.

Du Mont Engineer conducting final tests, prior to installation, of Du Mont 5 KW Air-Cooled Transmitter, Series 7000/8000, at Du Mont's Clifton Plant.

in electronic research

Du Mont

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The most remarkable advances in electronics today center around the Cathode Ray Tube. Radar, Loran, Oscillography, Television all have this tube as their heart.

Du Mont developed this tube. Du Mont research took it from a laboratory curiosity to a practical electronic device.

For twenty years the Du Mont research and development staff have pioneered in the technology of this new field of cathode rays. Among their products are the world's first Oscillograph, the first home Telesets,* the first television network.

On the foundation of this solid engineering achievement Du Mont has become the world's largest producer of scientific instruments using the cathode ray tube. The Du Mont television receiver assembly plant is the world's largest.

Guiding all Du Mont thinking has been—and will continue to be—the firm resolve to lead the way in the fruitful application of cathode ray electronics to the service of America.

DU MONT

Precision Electronics and Television

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asserted, will be kept as high as possible. "Our effort now," he said, "is to impress everyone with the need for a united effort so manufacturers will become less company and more defense-minded."

Major Ames also emphasized aid to manufacturers, in his talk to the new chapter, stating that his office is ready to assist in getting machine tools and materials, as well as in manpower, quality control, and security problems. The importance of the photographic industry to the defense effort is not generally realized, he declared, but that it is important is the main reason for his procurement office being located in Rochester.

ED. NOTE: The photographic industry is important to the AFCA and to SIGNAL also, and we therefore have especial pleasure in greeting the new Rochester Chapter. The first president, Joe Wilson, and the other chapter officers, have put considerable effort and enthusiasm into the formation of the new group and we predict that in time to come every AFCA member will realize that we have all been benefited by the activities of the Rochester Chapter.)

Sacramento

A tour of the U. S. Naval Reserve Training Center in Sacramento featured the chapter's January 31st meeting.

Commander Hugo Osterhaus was host to the chapter for the evening. Members and guests were given an opportunity to view at first hand the complicated equipment required in the operation of a large naval vessel. The tour of the center, which simulates the actual workings of a ship, included navigation, plotting, radar, radio, communications, and many other allied activities. Naval training films were also shown and were of interest to all.

The chapter's February 26th meeting honored Brig. General A. M. ("Pete") Shearer on his retirement from service as chief of the procurement & distribution division, Office of the Chief Signal Officer. The record attendance of 300 was evidence of the affection and esteem with which General Shearer is held in that area. Founder and first president of the chapter, and former commanding officer of the Sacramento Signal Depot, he is now civil defense coordinator of the Fourth Civil Defense Region of California.

The featured speaker of the evening was Dr. Robert A. Scalapino, assistant professor of political science at the University of California, who gave an excellent talk on a very timely topic, "The Crisis in China." Dr. Scalapino is well qualified to speak authoritatively on his subject, having had wide Far Eastern training, experience, and research linguistic background both in educational and military intelligence fields. He is the author of "An Analysis of Political Party Failure in Japan—1874-1940," plus his contributions to the Far Eastern Survey and Foreign Policy Reports.

Activities commenced at 6 p.m. with a social hour in the Sacramento Signal Depot officers' mess, followed a turkey dinner in the post restaurant. Chapter President Paul Carrington officiated as master of ceremonies.

Besides General Shearer, other distinguished guests included: Maj. Gen. W. M. Robertson (retired), chief of civilian defense for the State of California; Maj. Gen. Junius W. Jones, commanding general, Sacramento Air Materiel Area, McClellan Air Force Base; Col. James F. Olive, deputy commander, Mather Air Force Base; and Mr. Bliss Harper, assistant to General Shearer for the Fourth Civil Defense Region. In addition, many other community and military leaders were in attendance, some traveling quite a distance for the occasion.

Committee members in charge of the meeting were: Col. F. T. Gillespie, commanding officer, Sacramento Signal Depot; Lt. Colonels F. H. Wright and Leo Tamamian; Majors C. M. Godfrey and Irving J. Scott; Captains Eldred Powell and Albert Craig; Lt. Robert R. Davies; CWO Orville Leister; Messrs. James A. Board, Cyril A. House, Cyril A. Bairos, Charles W. Alward, John Buechner, William Calhoun, Joseph Starzec, W. E. Thomas, Jr., Robert J. McMorrow, David P. Crockett, Joseph A. O'Doul, Vernon D. Carpenter, Charles Clemens, Anderson A. Cordill, Wilbert V. Falck, Joseph R. Kowalczyk, Robert D. Livingston, Paul E. Shaad, Wilbur Smith, A. R. Tanner, Robert V. Watkins, and Henry F. Wild.

San Francisco

Captain A. L. Becker, commander of the San Francisco Naval Shipyard, was the principal speaker at the chapter's February 1st meeting held at the officers' club of the San Francisco Naval Shipyard.

With "Communications—Weapon for Defense" as his subject, Capt. Becker stressed the need for new and faster methods of communications in order to safeguard American defenses, as without communications there would be no defense. He cited the need for the expansion of coaxial cable facilities in order to relieve the shortage of copper now going into numerous wire and cable lines. He also stressed the need for long range television and facsimile equipment, as well as better undersea communications.

Prior to the dinner-meeting, the members and guests were conducted on a tour of the shipyard by W. R. Pengro, public relations officer. The tour included a trip through a submarine and a close-up view of most of the ships under construction or being recommissioned.

During the business portion of the meeting, the following were elected to the chapter's board of directors for a two-year term: Harry E. Austin, Comdr. Ernest C. Underwood, Maj. Thomas H. Dooling, Col. Henry L. Schnoor, and Capt George H. Knight.

Seattle

Plans for programs at future meetings were formulated at the January 10th chapter meeting at the Chamber of Commerce Building. Demonstrations and lectures on new developments in the communications field will be emphasized. A local representative of the General Electric Company advised that a demonstration of an electronic selector system would be made available for the chapter's June meeting.

The advantages of membership in the AFCA were pointed out to the various guests present by Chapter President Marshall B. James and Membership Chairman Frank D. Keyser. Mr. James emphasized the interesting contents of SIGNAL magazine, and Frank Keyser stressed the advantages to all concerned of a greater diversity of membership from the armed services and commercial and industrial organizations.

An interesting and informative Pan American Airways film on the Clipper Planes concluded the evening's program.

Washington

The Washington Chapter devoted its March 7th meeting to honoring the Chief Signal Officer, Major General Spencer B. Akin, who was soon to retire from active duty, while at the same time commemorating the 88th anniversary of the Army Signal Corps.

Over 300 AFCA members and guests jammed the National Press Club auditorium, where the chapter has been holding all of this season's meetings, to honor General Akin and to hear tributes paid the retiring Chief Signal Officer by Defense Production Administrator William H. Harrison, Army Chief of Staff General J. Lawton Collins, and Under Secretary of the Army Archibald S. Alexander.

Leading industry, government, and armed services officials attended the luncheon meeting which was a standout in the Washington chapter's history. The demand for tickets was such that soon after the meeting announcements had gone out the ticket requests reached the auditorium capacity figure, with the result that many requests had to be refused.

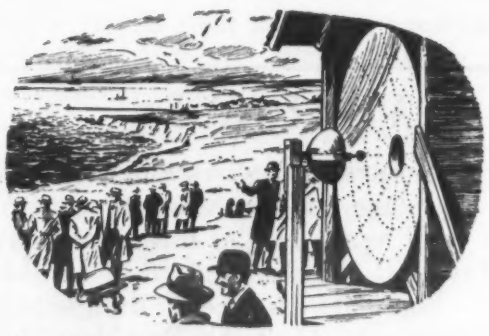
The final meeting of the season for the chapter will be held in May at Annapolis, by invitation of the Naval Academy, and early signs are that that meeting will hit capacity, too.

For pictures and further details of the March 7th meeting, see this issue's cover, the photos on page 13, *and story on page* 48.)

What every industrial executive should know about

MICROWAVE

In 1931, International Telephone and Telegraph Corporation became the world pioneer—the *first* to beam man's voice through space by microwave. Today microwave has become the fastest growing communications system for spanning mountains, swamps, rivers and other natural barriers without costly wire lines—a system that is virtually immune to storm damage. And today IT&T is still the recognized leader, with its greatly advanced "pulse time multiplex" method of microwave transmission. If your company is planning to set up, expand or replace its own cross-country communication system, look first to PTM microwave. This versatile, flexible, new method provides for multiple speech channels, unattended telegraph, telemetering, remote control and other signaling. PTM microwave is available through *Federal Telephone and Radio Corporation*, an IT&T manufacturing associate.



IT&T engineers successfully demonstrate first voice transmission by microwave, Calais to Dover, March 31, 1931.

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INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION, 67 Broad Street, New York

For information on microwave communication systems, address: *Federal Telephone and Radio Corporation*, 100 Kingsland Road, Clifton, N. J.

NEWS—SERVICES and INDUSTRY

communications - electronics - photography

Brig. Gen. George I. Back Is New Chief Signal Officer

The announcement that Brigadier General George I. Back has been appointed Chief Signal Officer came just as SIGNAL was going to press, limiting us to this bare mention of the appointment.

Until his selection to become head of the Signal Corps General Back had been Chief Signal Officer of the Far East Command with headquarters in Tokyo. He had also been president of the AFCA's Far East Chapter since the chapter's inception.

Full story will follow in SIGNAL's next issue.

Communications Policy Board Report Released

An exhaustive 238-page report with one basic recommendation, the creation of a three-member telecommunications advisory board to formulate a national telecommunications policy in such fields as frequency assignments and the operation of communications systems by government agencies, was issued by the White House March 27.

Releasing the report of the President's communications policy board, headed by Dr. Irwin Stewart, president of West Virginia University, the White House issued no statement, but merely made the full text available to the public without comment.

Recommendations of the board were as follows: (1) establishment of the three member board, or possibly a single telecommunications adviser, in the executive branch, to recommend legislation to the President, establish a system of justification of frequency assignments to federal government agencies, and supervise the division of frequency space between government and non-government users; (2) strengthening of the FCC in funds and organizational structure; (3) strengthening of the Department of State; (4) stronger machinery for other government agencies interested in communications; (5) stepping up of the federal government's program for conducting and stimulating communications research, especially in the propagation and frequency utilization fields; (6) immediate attention by the proposed board to stimulating technical developments to strengthen overseas communications; and (7) basing the U.S. communications policy on most effective use of the frequency spectrum, encouragement of the health of the privately-owned communications systems as a national asset, and remaining alert to the problems of the communications field.

In the Capitol it was felt that the board had done an excellent job of bringing up to date, outlining, and pointing up the basic problems which face the communications industry and the government in seeking a national communications policy. It was pointed out that the board, in its deliberations, had faced a task of enormous magnitude. But it was understood that the board's recommendations did not meet with the full approbation of government agencies particularly concerned with communications, and that Congressional quarters were disappointed by the absence of legislative recommendations. The view was expressed that the specific recommendation for a permanent communications policy agency in the executive branch of the government would not meet many of the basic problems outlined, especially the division of frequency space between government agencies and other users, and the absence of a cohesive national policy in the communications field.

Since no legislative proposals were offered, and the White House gave no indication as to whether or when it would act on the recommendations, it was next to impossible to forecast what the next step in the communications policy field would be. One likely source of action in the coming months, however, is the Senate Interstate and Foreign Commerce Committee, which has been awaiting the CPB report before taking any major steps in its long-standing study of the entire communications field.

Gen. Akin Honored At AFCA Meeting

Notables Pay Tribute to Retiring CSO

The service career of Major General Spencer B. Akin, especially in his administration as head of the Signal Corps, was lauded by leading officials of industry, government, and the armed services at a luncheon meeting of the AFCA's Washington Chapter March 7th.

Over 300 AFCA members and guests jammed the National Press Club auditorium to honor General Akin and to hear tributes paid the retiring Chief Signal Officer by Defense Production Administrator William H. Harrison, Army Chief of Staff General J. Lawton Collins, and Under Secretary of the Army Archibald S. Alexander. Chapter program chairman Percy Black, Automatic Electric Co. vice president, read a message from AFCA President Theodore S. Gary, and briefly brought out the communications-electronics-photography industry's high regard for General Akin.

The speakers emphasized General Akin's brilliant record as a combat soldier and his ability to direct the Army's communications-electronics-photography operations, procurement, and training —so critically important in the current Korean emergency.

General Harrison, describing the advances both of civil and military communications in an "incredibly short time," said the rapidity of advancement is best illustrated for him by the fact that 88 years ago, when the Signal

Armed Forces Day

Armed Forces Day, established last year in place of the separate service dates, will again be the third Saturday in May will be observed May 19 this year. The date has been designated, with the approval of the President, for observance by the military services and the public.

The day has an even deeper significance this year, and the Secretary of Defense has expressed the hope that the day will be observed on a wide scale to the end that the public may become better acquainted with the workings and equipment of the armed services.

New MARS Chiefs

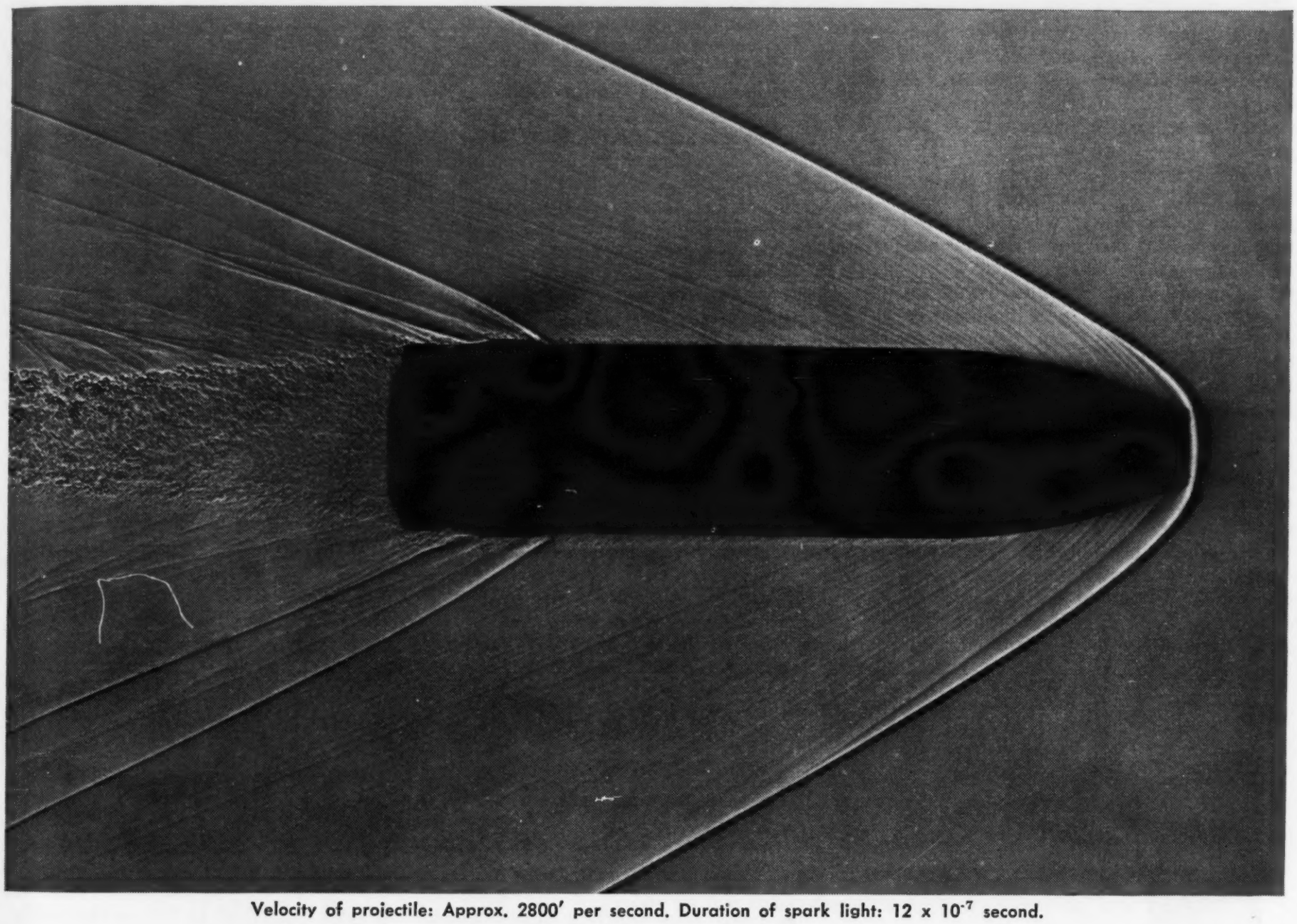
Both the Air Force and Signal Corps divisions of the Military Amateur Radio System have recently had changes in their supervisory heads. Captain Charles C. Mack, USAF, has replaced Major Raleigh H. Ralls, USAF, as head of the Air Force section of MARS and Captain Lester A. Peterson, SC, has taken over as chief of the Signal Corps section, replacing Major Edward L. Nielson.

THIS DEPARTMENT'S PRINCIPAL SOURCE

Telecommunications Reports

Roland C. Davies, Editor
National Press Building
Washington, D. C.

TAKE A MICROSECOND LOOK AT A PROJECTILE IN FLIGHT



Velocity of projectile: Approx. 2800′ per second. Duration of spark light: 12 x 10^{-7} second.

How Centralab Engineers solved a problem in Electronics for Ultra-High Speed Photography

CERAMIC TUBULAR DIELECTRIC REPLACES 30′ OF STANDARD SOLID DIELECTRIC COAXIAL CABLE—LIGHT INTENSITY BETTERED 900 TIMES

Former Method

Centralab Condenser

Ultra-speed photographs are taken with the light of an electric spark. Former method used 30 feet of co-axial cable transmission line — charged with 10,000 V.—and discharged across a spark gap.

To replace the bulky cable, Centralab developed a tubular ceramic condenser (2″ O.D. x 6½″ long) with silver electrodes fired to the inner and outer surfaces. The condenser is charged (to 10KV) and discharged exactly like the cable — *however with a gain in light intensity of 900 times!* Characteristics of the new Centralab ceramic condenser are:

Dielectric Constant....6000 at 1 megacycle
Capacity .....24,000 mmf.
Velocity propagation.....027 x velocity propagation in air.
Impedance.....Approx. 1 Ohm
Decay time,
peak to I/e peak.....2 x 10^{-7} second
Rise time, O to peak.....1 x 10^{-7} second
50% of peak limits.....1.8 x 10^{-7} second

CENTRALAB engineers know their electronics and ceramics! This single ceramic development greatly advanced the photo-study of turbulence, ultra-sonic wave structure, and other high-speed phenomena. But this is just one of literally thousands of electronic component problems solved by Centralab. For Centralab engineers have compounded and tested over 20,000 different ceramics. So if you have a problem in electronics — in radio or radar . . . in TV, FM or X-ray — that Centralab Ceramics might solve . . . don't hesitate, call us in today!

Photograph and its technical data is gratefully accredited to Dr. J. C. Hubbard, Messrs. J. A. Fitzpatrick and W. J. Thaler, Dept. of Physics, Catholic U., Washington, D.C.

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Corps was founded, his father was in the War Department.

Describing General Akin as a "truly distinguished American," General Harrison pointed out that his career is "not unlike those of many men of imagination and integrity who have dedicated their lives to the public service." Recalling that General Akin was General Douglas MacArthur's signal officer from Corregidor to Japan, the DPA Administrator emphasized the meaning, in terms of World War II history, in "that simple statement—Corregidor to Japan."

General Harrison, who directed the Signal Corps' $5 billion procurement program during World War II, declared that no one was ever better qualified by experience to be Chief Signal Officer than General Akin. He added that the present day record and accomplishments of the Eignal Corps demonstrate that General Akin's experience has been put to the fullest use in his service as Chief Signal Officer.

General Collins, describing himself as "dreadfully sorry," to lose General Akin from the ranks of the Army, said that the fact that "we have had such a distinguished soldier as Chief Signal Officer is a tribute both to the Signal Corps and to the civilian industry, without which the Signal Corps could not function. He emphasized that when Army-civilian liaison is criticized, as in a recent magazine article, "all we can do" is reiterate that the Army could not operate without its close association with civilian industry.

General Collins said that the authors of the magazine article are being invited to observe the operations of the main Signal Corps center at Fort Monmouth, N. J., so that they can see the close working relationships between the Signal Corps and the nation's leading research and manufacturing organizations. (*General Collins was referring to an article in the Saturday Evening Post entitled "What's Wrong With The Army?"*)

The "heart and soul" of military command is communications, General Collins, one of World War II's top fighting generals, stressed. He recalled that in the late stages of World War II his forces and those in another sector were able to close a gap in their lines and smash a German attempt at a breakthrough out of the Ruhr because, acting on up-to-the-minute intelligence reports, he had been able to work out detailed plans with other commanders in an hour's time via a radio and landline system, which spanned both Allied and enemy territory over a broad area.

Under Secretary Alexander, who supervises the Army's procurement functions, said that it has been a "wonderful thing" that the nation could produce a man like General Akin, who not only distinguished himself in the Pacific fighting, but proved to be the "diplomat" and "hard bargainer" required as chief of an Army technical service.

General MacArthur, in a message read at the luncheon, declared that "the accomplishments of the Signal Corps in this theater constitute another brilliant chapter in its history—a chapter in consonance with the highest traditions of the Corps and one which should be an inspiration to all members of your great organization."

Other messages read at the luncheon included tributes from Maj. Gen. Percy W. Clarkson, in the Pacific area; Lt. Gen. Steven J. Chamberlin, commanding the Fifth Army; General Thomas T. Handy, commanding the European Command; General Willis D. Crittenberger, commanding the First Army; Lt. Gen. M. H. Silverthorn, acting commandant of the U. S. Marine Corps; Lt. Gen. LeRoy Lutes, commanding the Fourth Army; Lt. Gen. Manton S. Eddy, commanding the Seventh Army; General William E. Kepner, commander-in-chief in Alaska; Maj. Gen. Frederick A. Irving, superintendent of the U. S. Military Academy; and Maj. Gen. Remzi Bilshev, of the foreign aid group in Turkey.

AFCA President Gary, in his message, declared that General Akin's "outstanding accomplishments have inspired us all and give us the courage to continue in our daily tasks."

General Akin, in response, paid tribute to the personnel of the Signal Corps, as well as the Department of Defense and other government agencies, and declared that he has "leaned

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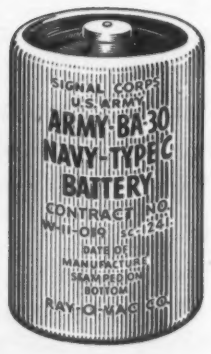

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. . . *plus this guarantee:* "If your flashlight is damaged by corrosion, leakage or swelling of this battery, send it to us with the batteries and we will give you FREE a new, comparable flashlight with batteries."

Now being made—the second billion!

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very heavily" on representatives of civilian industry during his service as Chief Signal Officer. He declared that the integration of civilian and military effort has enabled the production of the best communications equipment the Army has ever had, and what he believes to be superior to that of any other nation.

The Chief Signal Officer added that he is "deeply indebted" to Senate Majority Leader Ernest W. McFarland, and Edward Cooper, assistant to the Majority Leader, as having been "most helpful" in considering communications problems. He praised also the work of the Senate and House appropriations committees and their relationships with the Signal Corps, as well as other government agencies, including the FCC, the State Department and its telecommunications policy staff, and the Budget Bureau, for their understanding and help. He especially mentioned FCC Chairman Wayne Coy and Francis Colt deWolf of the State Department. General Akin also said he is "indebted" to the press, particularly citing Roland Davies' *Telecommunications Reports* for effective reporting of communications news.

Others among the leading industry, government, and armed services officials attending the AFCA Washington Chapter luncheon to honor General Akin, were:

Rear Admiral John R. Redman, USN, Director of Naval Communications.

Major General Francis L. Ankenbrandt, Director of Air Force Communications.

W. Walter Watts, RCA Engineering Products Vice President, and

C. E. Wampler, AT&T Co. Assistant vice president, now on leave as top assistants to Gen. Harrison at DPA.

George Sterling, FCC Commissioner.

Maj. Gen. W. O. Reeder, Deputy Chief of Staff of the Army for Logistics.

Maj. Gen. K. B. Lawton, Deputy Chief Signal Officer.

Brig. Gen. Wesley T. Guest, Chief of Army Communications Service Division.

Brig. Gen. E. V. Elder, chief of procurement and distribution, OCSIGO.

Brig. Gen. Ivan Farman, Deputy Director of Air Force Communications.

Brig. Gen. Wallace G. Smith, Commanding General, Airways and Air Communications Service.

Capt. William Beltz, USN, Assistant Chief for Electronics, Navy Bureau of Ships.

Francis Colt deWolf and Harvey Otterman, Chief and Associate Chief of State Department Telecommunications Policy Staff.

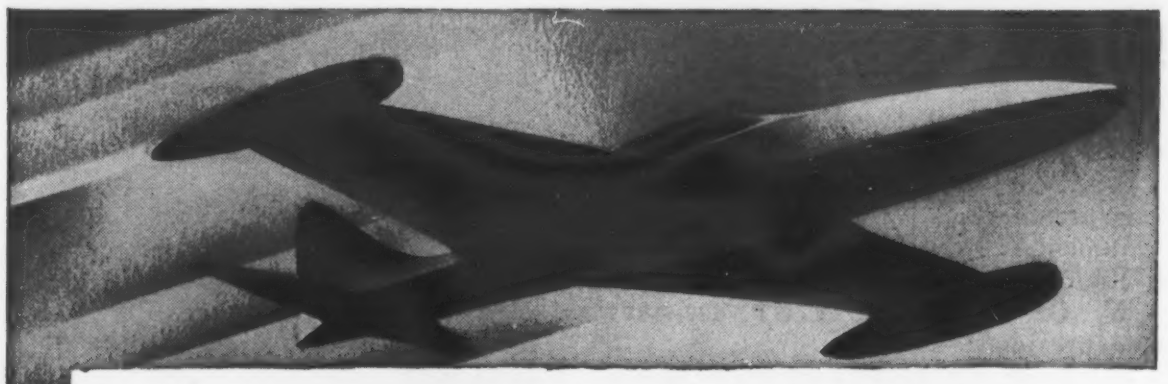
Marvin Hobbs and Thomas Perrott, Chief and Assistant Chief, Munitions Board Electronics Division.

Leighton Peebles, Communications Equipment Division, NPA.

Col. E. Blair Garland, C.O., 1807th AACS Wing in Europe.

Glen McDaniel, newly elected RTMA president.

Leonard Jacob, IT&T vice president.



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NEWS

Orrin Dunlap, Jr., RCA vice president.

W. J. McManus, C&P Telephone Co. vice president.

James A. Kennedy, American Cable & Radio Corp. vice president.

W. G. Thompson, AT&T assistant vice president.

K. Bruce Mitchell, Director, Western Union International Communications.

Harry Flory, U.P. Director of Foreign News and Communications.

James D. Secrest, RTMA general manager.

F. P. Guthrie, RCA Communications assistant vice president.

K. W. Heberton, Western Union assistant vice president.

Talbot Heads Civil Defense Warning

Col. William H. Talbot, USAF, ret., has been named director of the Federal Civil Defense Administration's newly-created warning and communications division, which has responsibility for the design, installation, and operation of the nationwide warning system that will give timely warning to local civil defense agencies and the public of imminent or actual enemy attack. The new FCDA division is also charged with the design of control centers and associated communications of all types that may be required to control the many elements of civil defense in pre-attack and post-attack phases.

A 1929 graduate of the U. S. Military Academy, Col. Talbot was a Signal Corps officer prior to World War II. He was assistant signal officer for the 8th Corps Area, Texas, and later developed modern communications for cavalry divisions while signal officer, 1st Cavalry Division at Ft. Bliss. Subsequently he worked in the development and installation of radar and communications for air defense and air raid warning systems for the U.S. and its possessions. He also helped develop air support of ground troops in field operations and conducted communication necessary to effect radar bombing. In England, during the war, he was signal officer for the 9th Bomber Command.

In 1946 Col. Talbot retired from active duty and, except for a period in 1949 when he was recalled to active duty to develop a ground observer corps and an air raid warning system for the Air Force, has been employed by the Chesapeake and Potomac Telephone Co. in Washington, D. C.

New SMPTE Committee Formed

Bill Rivers To Be AFCA's Representative

The first meeting of the Society of Motion Picture and Television Engineers' subcommittee for technical and engineering society liaison has been tentatively scheduled for the week of April 30th in New York City.

The AFCA has designated for its representative to the committee's initial meeting William H. Rivers, a director of the AFCA New York Chapter. A Fellow of hte SMPTE, and now with the Eastman Kodak Company, "Bill" Rivers served as a major in the Signal Corps during World War II.

The new subcommittee, an extension of the SMPTE's Committee on High Speed Photography, has been formed to effect improved liaison between the SMPTE and other technical societies to the end that photographic techniques developed or utilized by the various societies be better publicized.

These technical societies, it has been pointed out by SMPTE spokesmen, find motion picture photography a valuable tool in their respective fields, but usually the event they photograph receives the major emphasis, and the instrumentation phase is incompletely described. By means of the new subcommittee it is expected that in bringing together representatives of the various societies the problem can be defined more exactly, and that possibly a permanent liaison organization can be formed to correlate information on photographic techniques for ready accessibility to new workers in the field.

The following organizations have been invited to meet with the SMPTE subcommittee:

American Chemical Society.
American Institute of Electrical Engineers.
American Physical Society.
American Society of Mechanical Engineers.
Armed Forces Communications Association.
Biological Photographic Association.
Institute of Aeronautical Sciences.
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Airborne Electronics Conference

Meeting Will Honor Gen. McClelland

The Conference on Airborne Electronics, which held its first meeting in 1949, and now has become an annual event, will honor Maj. Gen. Harold M. McClelland, director of communications-electronics for the Department of Defense, at its 1951 meeting at Dayton, Ohio, May 24.

Conducted by the Dayton Section of the IRE in the two previous years, the Conference this year will be jointly sponsored by the Dayton Section and the newly formed IRE Professional Group on Airborne Electronics. With 75 technical papers and 40 exhibits to be presented, an attendance of about 1000 is expected for the meeting.

The conference will pay tribute to Gen. McClelland as one of the real pioneers in airborne electronics—one of the first of the early radio-minded pilots who planned and pleaded for the creation of "airways" and better communications for the then Air Corps. Gen. McClelland was largely responsible for the setting up of the Airways and Air Communications Service, which he subsequently headed, and when during World War II he received the Distinguished Service Medal, the award stated that "he pioneered in military electronics, analyzed the enemy's scientific research in this field, and instituted radio and radar countermeasures."

At the first Conference on Airborne Electronics in 1949 Frederick R. Lack, Western Electric vice president, and in that year president of the AFCA, was the principal speaker. The AFCA has been invited to participate again this year, and, as has been suggested by the Dayton group's president, Charles J. Marshall, will probably enter into a closer relationship with the Conference in this and future meetings.

Korea Demonstrates Specialist Need

The fighting in Korea has definitely pinpointed the essentiality of training and experience for the actual fighting troops and for the technical specialists such as those who operate and maintain the communications-radio-electronic equipment used by the three armed services. And the successes of the United Nations troops, composed so largely of American Army, Air Force, Marine and Naval forces, in recent weeks have been brought about to a major extent by the increasing experience and skill in the utilization of military weapons.

The leadership of the U. S. armed

A page from the note-book of Sylvania Research

Sylvania research in semiconductors leads to development of new Germanium Photodiode

The new Sylvania Germanium Photodiode, the tiniest photosensitive device ever manufactured, is another example of the dividends of Sylvania's broad program of basic research.

Basic research on semiconductors, one important phase of this program, has promoted a better understanding of the mechanism of current flow in semiconductor materials. The new 1N77 Photodiode, for example, is a result of studies of the variation in resistance of germanium caused by radiant energy.

It will make possible, for the first time, very small size automatic multiple counting, inspecting and recording systems.

Other research in this field has contributed to the improvement of germanium and silicon crystal diodes which are now widely used in television sets, electronic computers and military radar equipment.

The operator above is preparing for the measurement of fundamental galvano-magnetic behavior of a germanium crystal. The sample is mounted on the small insulating block within the glass chamber, which may be evacuated. The influence of a strong magnetic field upon the current path through the semiconductive germanium may be determined by placing electrodes at suitable points on the surface of the crystal. The temperature of the crystal may be varied from $+600°C$, to $-195°C$.

SYLVANIA ELECTRIC

ELECTRONIC DEVICES; RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC TEST EQUIPMENT; FLUORESCENT TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; PHOTOLAMPS; TELEVISION SETS

services, early in the Korean combat, realized the imperative value of having trained and expert communications personnel. As a result, all of the armed services launched intensive programs to instruct communications men, and to increase greatly the number of officers and enlisted personnel in their respective training schools.

The Air Force, under the guidance and overall direction of Maj. Gen. F. L. Ankenbrandt, Director of Air Force Communications, immediately after the outbreak of hostilities in Korea, blueprinted a rapid expansion of personnel in training in communications and electronics within the shortest possible time. Under the previous "economy keynote" of former Defense Secretary Louis Johnson, there was only what might be described "attrition" training in the communications-electronics field. In highly technical phases of Air Force communications, such as more advanced radar fields, there were shortages of training activities. However, under the guidance of General Ankenbrandt, the Air Force engaged in a rapid expansion of communications training, with only a slight lag between the new requirements of the growing Air Force. Training courses were expanded and shortened, highly specialized courses were initiated and in some cases, where equipments were extremely technical in nature, training of highly qualified, hand-picked personnel was conducted by the equipment manufacturers at their own plants.

It is considered noteworthy, according to authoritative sources, that the Air Force training and realignment of available communications-electronics personnel was conducted in such orderly fashion that, despite the high qualifications required at no time was the Air Force or any of its elements inoperational due to the lack of qualified communications personnel.

In addition to expanding the AF training program, it became imperative at the outset of the Korean emergency to throw a limited number of ready qualified personnel into the gap caused by the expansion until the training program could get fully under way. This situation was alleviated to a great extent by the Air Force organized reserve. Prior to the Korean hostilities the ordering into active service of reserve personnel has been limited, except in rare instances, to AFROTC graduates. But an immediate need was felt for personnel qualified in certain specialties. Initially, among officers, the recall was limited to qualified individuals in the grade of captain and below, but later, as the expansion continued, this was extended to include a limited number of highly qualified officers in the highest grades who were needed for special assignments. At present, the Air Force has gradually begun to taper off its requirements.

The Signal Corps, in line with the continual insistence of Maj. Gen. S. B. Akin, Chief Signal Officer, that trained communications specialists will insure the efficient use of wire and radio equipment, has doubled the capacity of its three Signal Schools from 6200 students to 12,000. The Signal schools comprise the largest one at Fort Monmouth, N. J., the Southeastern Signal School at Camp Gordon, Ga., the Signal Supply School at Fort Holabird, Md., and the intensive instruction in maintenance of a communications equipment established at all signal depots and signal sections of Army general depots. A new Signal Corps training school to handle 6,000 troops is slated to be reactivated April 15 at Camp San Luis Obispo, Cal.

All these Signal Corps instruction centers have increased the tempo of their training by the recent adoption of the 48 hour training week, which will further reduce the overall time spent in formal school training and will also speed up the readiness date of the units. By reducing the training time of specialists in the signal schools, particularly at Fort Monmouth and Camp Gordon, and concentrating the essential training required into the shortest time possible, the program has provided a greater number of qualified communications specialists at a much earlier date for the forces in Korea and for the units training in the United States.

The sudden shift from peacetime training of specialists, and this course of action placed a tremendous burden upon the signal schools.

Signal Corps personnel receive basic training at the Signal Corps replacement training center at Camp Gordon, and also in Signal Corps units in the various Army camps and establishments throughout the country. Communications specialists' training for certain lesser technical skills is also conducted in the Camp Gordon replacement training center and in signal units in the field. The Camp Gordon RTC was originally established to train a total of 1,760 enlisted men at one time, but has now been expanded to a capacity of 6,000 enlistees, with a weekly input of 440 from the reception centers. New signal units have been activated and several civilian component units have entered active service, the latter providing the means for training additional personnel.

The increased communications work load for Naval Communications, resulting from the Korean operations, has created a sudden and unexpected demand for communications personnel in the Navy. The brunt of this demand was met at first by ordering reservists into active Naval service, but in order to provide additional trained personnel, and to relieve the reservists, the training facilities in the Navy have been expanded.

With Rear Adm. John R. Redman, Director of Naval Communications, taking a leading role in the blueprinting of the expanded training program, most of the expansion has consisted of increasing the capacity of existing schools. However, two "teleman" schools have been established since the

Korean operations began. A new "radioman" school will soon be established at the Naval Training Center, Bainbridge, Md. A refresher course for communications officers has been provided at the General Line School, Monterey, Calif.

A large percentage of the experienced radiomen in the Naval reserve communications program are now in active service. However, reserve drill circuits have been continued in operation at reduced speeds in order to train new operators.

At the present time, there are more than 10,000 Airways and Air Communications Service airmen requiring technical training, either within operational units or at formal schools established by the U. S. Air Force. This figure represents more than 50% of the personnel strength of the AACS which is headed by Brig. Gen. Wallace G. Smith. The outbreak in Korea and subsequent decision to increase the size of the Air Force will result in an even greater emphasis on the technical training.

One of the inherent difficulties in an AACS training program is that of preparing standard instructional guides for all personnel. The global distribution techniques of the AACS and its diverse operational requirements makes standardization of subjects extremely difficult. ? ? ? Where Arctic training is of prime importance to one area, it has no meaning or necessity in the tropics. The technique of overcoming sand static in Dhahran is of only academic interest to maintenance men in Alaska. The station chief at Anchorage is only mildly interested in how to use coconut trees in an antenna farm.

However, standard instructional guides are indispensable if flexibility of personnel is to be maintained in order to allow for rotation from one area of assignment to another. It is these instructional guides that provide objectivity to AACS field training and enable AACS men to acquire requisite knowledge and skills for duty in a global communications system, it was pointed out.

As the primary mission of AACS is operational, all training efforts are so conducted that they interfere as little as possible with actual operations. As-

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signed personnel are provided requisite fundamental training in their specialty by the Air Training Command. AACS aims to increase the knowledge and skills acquired in the Air Training Command and to develop greater ability to perform the specialized duties of AACS.

There are nine types of training designed for the members of the AACS. These include: formal training in one of the established Air Force training agencies; organizational in-station technical training; factory training to develop specific skills on equipment or AACS procedures, which embraces now approximately 300 key airmen, and participating in it are organizations like Western Electric, RCA, Western Union, Civil Aeronautics Administration, and others; collateral training; refresher training for recalled reservists and newly assigned airmen; upgrade training to acquire new knowledges and skills; on the job training embracing routine duty performance on specific assignments; area training centers established by Wings and in dependent groups whenever a training requirement on new techniques, equipment and procedures cannot be accomplished within the operating units by an established field training program; and missionary training conducted by traveling instructors.

In its intensive program to instruct communications personnel in the importance and technique of maintaining and operating their equipment, the Signal Corps had established, it was announced recently, "maintenance advisory teams," composed of highly skilled electronic technicians of both the Signal Corps and obtained from the communications-electronics industry on a contractual basis, to visit all Army installations and help Signal units and communications personnel in the other branches of the Army to solve their maintenance problems. Emphasis is placed on having equipment at peak performance and ready for use in combat at all times. This program was commenced this winter by General Akin after a visit to the Korean front.

NAVY

Navy Electronic Funds

$1 Billion Obligated By April

Approximately $1 billion of the Navy Department's current 1951 fiscal year fund for electronics and radiocommunications equipments will be completely obligated in letters of intent or signed contracts with the radio-electronic manufacturers by the end of April. The timetable of completing the negotiation of procurement contracts by the Navy through its three bureaus which engage in radio-electronic supply activities — Bureau of Ships Electronics Division, Bureau of Ordnance, and Bureau of Aeronautics—has moved satisfactorily in the past two or three months because the Office of Naval Material's leadership pressed to "clear the decks" so that its procurement machinery would be geared to carry on the huge procurement load when Congress appropriates the funds under the $2.8 billion fleet recommissioning and expansion program, authorized by Congress Feb. 26 and sent to the President.

The Bureau of Ships' electronics division, headed by Captain W. H. Beltz, has approximately $386 million for electronic equipment in the 1951 fiscal fund, all of which has been committed towards specific procurement projects, and this full sum will be completely obligated by letters of intent or signed contracts by April 1. The Marine Corps has available approximately $50 million with its communications-electronics equipment needs normally contracted for by BuShips or another military service.

The Bureau of Aeronautics had the largest amount under the 1951 fiscal funds in the electronics field—a total of about $615 million. The Bureau expects to have obligated 75% of these funds by the end of April.

Navy Speakers at Air Force School

Navy communications and electronics officers from the Office of the Chief of Naval Operations on April 9 visited the Air Command and Staff School, Maxwell Air Force Base, where they discussed Navy communications-electronics. They were:

Captain T. L. Greene, USN, and *Captain J. A. Morrison* from the Naval Communications Division.

Captain D. F. Krick, USN, from the Operational Readiness Division.

Comdr. D. J. Veazey, USN, and *Lt. Comdr. F. K. B. Wheeler, USN, Comdr. D. P. Wilson, USN,* from the Electronics Division.

Research Lab Technical Shorts

Radio Telescope

A 600-inch radio telescope being installed at the Naval Research Laboratory will enable scientists to study galactic radiations outside visible spectrum range—50 foot paraboloidal reflector will make use of 3, 10, and 30 centimeter wavelengths. The giant reflector, weighing 14 tons, was made of 30 aluminum sections bloted together and machined to a tolerance of 1/32 inch. A 27-ton gun mount carries the reflector through 360° azimuth and over 90° altitude. The entire installation weighs about 75 tons. Besides studying galactic radio emissions, the telescope will be used to make solar observations. Information thus gained may have practical application in longe-range weather forecasting and radio communications.

Attenuation Measurements

Attenuation and phase velocity measurements for coaxial transmission lines between 10 and 300 megacycles have been made by the Naval Research Lab through a method which reduces the measurement of attenuation to the linear measurement of the distance between two points on a slotted line. For low attenuation values the slotted line need not be more than a small fraction of a wavelength long. Measurements of phase propagation velocity at 50, 80, and 200 megacycles gave an average of 93.7 percent the velocity of light.

Amplifier

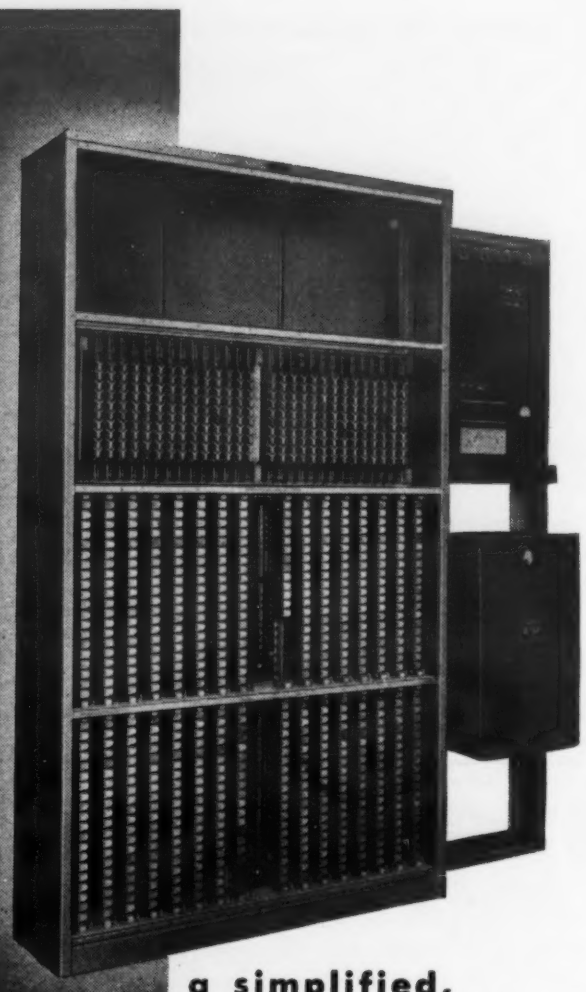
A self-contained, single-package amplifier has been developed by the Naval Research Lab for general microwave antenna and network measurements in conjunction with bolometer or crystal detectors. It has a continuously tunable frequency range of 400 to 5000 cycles, with calibration accuracy of plus or minus five percent. Linear response of the instrument over a range of 100db coupled with an automatic normalizer feature which corrects for amplitude variations in signal source makes it well adapted to diffraction pattern measurements.

Improved Insulating Materials

Two improved electrical insulating materials have been developed by the Naval Research Lab: One, a mica paper from low-grafe ore and scrap at a saving of high-grade stock, will stand intense heat, is stronger, and has greater capacitance than kraft paper. The other is an improved asbestos which forms readily into paper with excellent uniformity and high value as a dielectric; the manufacturing process involves a wetting process in which centrifugal action removes magnetite or iron oxide particles.

New Projection Technique

The Bureau of Naval Personnel is utilizing a new technique for screen projection of textbook charts in which an overhead projector and page-size



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The panel below tells how simple and easy it is to add to the Leich Dial System. A 20 page illustrated catalog gives more complete information. Write for it.

How you can add ten lines to the Leich Dial System in ten minutes.

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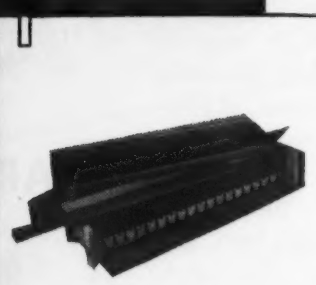
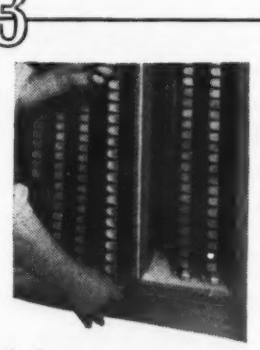


Single, jack-in relay bars contain the line and cut-off relays for each group of ten lines. These are carried in stock — wired, tested, ready to install.

2

This shows where the line relay bars are jacked-in. Every switch-board is fully wired and contains the jacks for plugging-in these 10-line relay bars up to full capacity.

3



All that's necessary is to jack-in the relay bar units as shown here. Each relay bar jacked-in adds 10 lines to the switch-board.

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transparencies eliminate costly and bulky charts and posters. Also, illustrations can be reproduced locally without involving contractual services, time-wasting orders and shipment. A dry reproducing process and sensitive reflex Auto positive paper or film make it possible to copy textbook illustrations on a transparent foil, in full color if needed.

Device For Study Of Navigational Equipment

An electronic device simulating an airborne interrogator has been developed and constructed by the Naval Research Lab for use in the study of navigational distance measuring equipment. The instrument produces output pulses whose time delay from corresponding trigger pulses can be varied at a predetermined rate, thus producing an illusion of motion or of variation in distance. This delay can be increased or decreased at rates equivalent to from 100 or 1000 knots with less than 5% error.

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AIR FORCE

Heroism of AACS Men Told

The heroic role of Airways and Air Communications Service control tower operators in the November evacuation of Marine wounded from the Chosin Reservoir area in North Korea has been described by an officer of the 1973rd AACS Squadron, who reported that the operators had all volunteered for the dangerous task of directing rescue aircraft into tiny Hagaru-Ri airstrip under enemy fire.

Capt. John J. Gamble, commanding an AACS detachment, said that he had been requested to furnish two control tower operators to run a mobile control jeep on the small strip south of the Chosin Reservoir to aid in the air evacuation of wounded men from that area.

"I called on all the operators not on shift to assemble," Gamble recalled. "After I briefed them on the mission, all six men volunteered."

On the mission, the two men finally selected for the job were in constant danger, with the enemy only 15 minutes away from their position. The two operators had to be flown into the strip every morning from Yonpo and evacuated each night.

The men chosen for the hazardous mission were Sgt. Douglas D. Havard and Cpl. Gillespie Thomason, Jr. The other four volunteers were Sgt. John R. Clark, Cpl. George T. Brodie, Cpl. Byrl C. Harlan, and Cpl. John Spatola.

Radio-Controlled Lifeboat

A radio-controlled lifeboat will chug up to some ditched airmen in the near future, and guided by an operator in the Air Force SB-29 rescue plane which dropped the boat, it will pick up the survivors and sail away on a gyro-compass course for the nearest land, with sufficient fuel on board for an 800 mile trip.

The 30-foot A-3 rescue boat, dropped with a 100-foot parachute, will be powered by a four-cylinder engine in a watertight compartment. Radio controls will permit rescue plane to drop the boat's rudder board, open engine vents, crank the engine, and steer the boat to the survivors. Subsequent movements can be controlled either by rescue planes or occupants of the boat.

Transmitters for boat control have already been installed in SB-29s, and complete system will be installed in all A-3 boats by early 1952.

Air Crash Locator Beacon

A tiny sending station that will be catapulted from crashed aircraft and then automatically send SOS signals is being developed by the Air Materiel Command at Wright-Patterson AFB.

In event of crash, the crash rescue locator beacon, which will be housed in an aluminum cylinder measuring about 7½ inches across and two feet high, will be thrown out of the plane to a spot about 50 feet away. A trigger mechanism will then release a mechanical system which will right the container. A 20-foot antenna will be raised and a transmitter housed in the capsule will start sending SOS signals hundreds of miles in all directions over a fixed frequency for 24 hours.

If the plane should ditch on the ocean the locator beacon will still operate even if it is completely submerged in water. Similar crash radio beacons no larger than a cigar are anticipated for future use in fighters. These, however, will transmit over a smaller local area.

Hawaiian MARS Station

Nightly radio contact is now being made with Johnston Island and Kwajalein by way of the new Military Amateur Radio station KH6FAA/AG6-FAA located at Hickam Air Force Base, Hawaii.

Station manager is Lt. Harold McDaniels who was instrumental in setting up the new station which can be used in making personal calls to members of the armed forces at outlying bases in the Pacific area.

A new MARS station has also been opened at Haneda, Japan, and stations at Guam, Manila, Midway, and Okinawa have been established by amateur operators and are in the process of being built up so that they may join the MARS network in the Pacific area.

Sylvania Pres. Is USAF Consultant

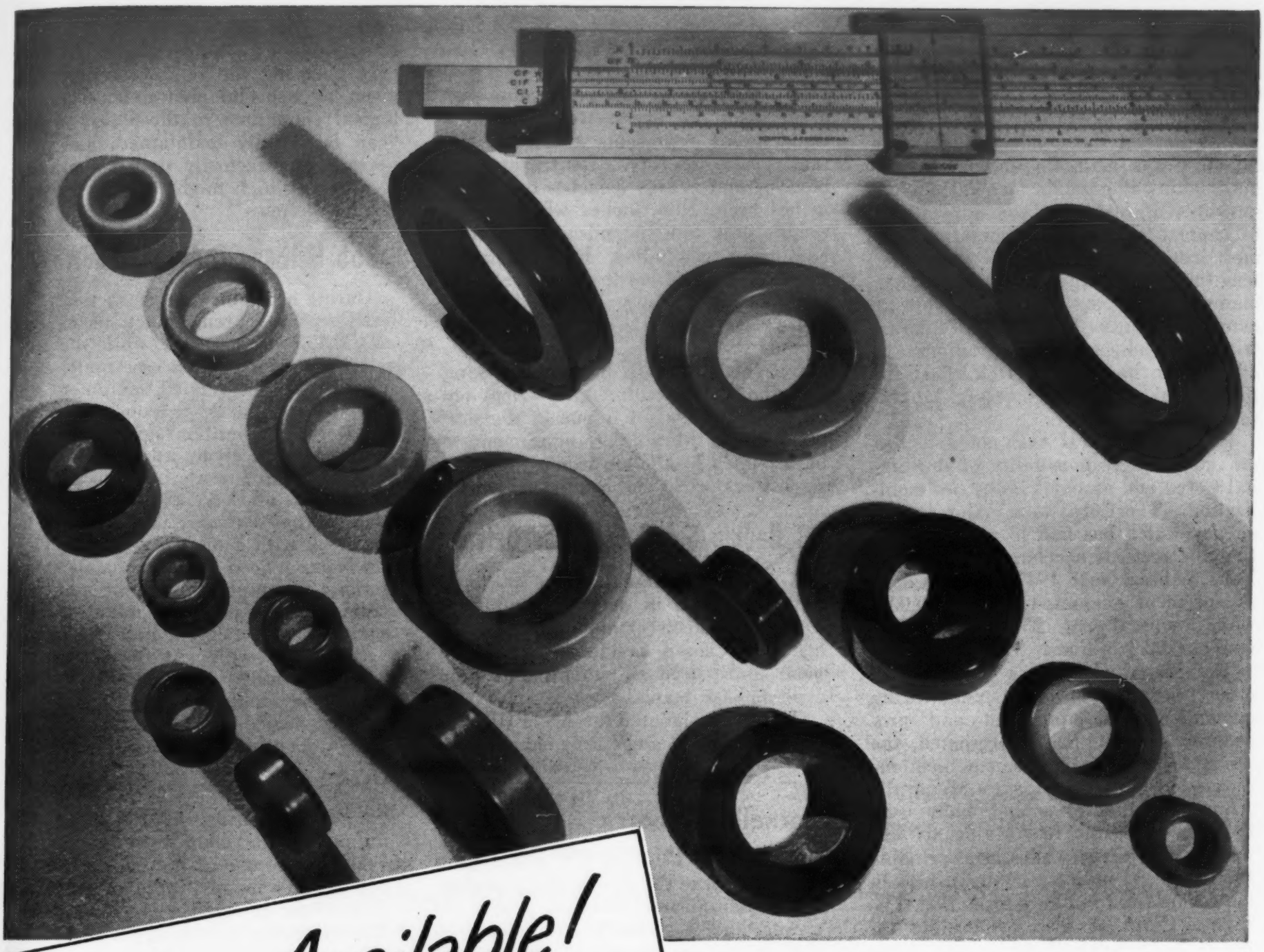
Don G. Mitchell, president of Sylvania Electric Products, Inc., New York, has been named special consultant to Under Secretary of the Air Force, John A. McCone. Mr. Mitchell will assist in the procurement of electronic equipment and components under the expanded Air Force program.

ARMY SIGNAL CORPS

Gen. Akin, Retiring, Reviews Integrated Communications Progress

Retiring from the Army March 31st, Major General Spencer B. Akin reported significant progress in the development of integrated military communications during the past four years while he has been Chief Signal Officer.

The story of the Signal Corps since World War II, General Akin stated, has been largely, though not exclusively, the emergence of integrated communications through a dual program of technical development of new equipment and long-range research. Basic in this program at the combat level have been the new walkie-talkie and handie-talkie radios, and a large new series of vehicular sets. With these radios, infantry, armor, and artillery



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can be closely coordinated as a combat team.

Integrated communications, however, go far beyond the combat zone. The Signal Corps maintain and constantly net, making it possible for Washington improves a worldwide communications to contact any area of operations almost instantly. To keep this huge system functioning, the Signal Corps has maintained research and development contracts with the laboratories of industrial and educational institutions, in addition to its own research efforts in the Signal Corps engineering laboratories.

Planning, General Akin noted, is also an important responsibility of the Signal Corps and includes industrial mobilization. The Corps is a major supply agency which has had to meet fluctuating and recently accelerating demands. Thus in fiscal year 1947, Signal Corps procurement amounted to $38,560,000, while for fiscal year 1951 it is expected to reach $2.3 billions.

The Signal Corps has worked with other services toward standardizing communications equipment and procedures and it has represented the Army in international communications discussions. It also makes all of the Army's training films and many used by other services. In addition, its still and motion pictures have been valuable for high-level military analysis, historical record, and public information. The Signal Corps is also responsible for about 37 percent of the entire Army literature program.

Korean Awards To Signalmen

That Signal Corps personnel have ample courage and technical ability, two of the prime requisites for first class combat soldiers, is evidenced by the citations and medals awarded members of the Corps for their service in Korea.

One of the most courageous was 2d *Lt. George E. Hannan,* who, in an extraordinary display of heroism, gave his life to protect the men in his command. He was awarded the Distinguished Service Cross posthumously. In another outstanding display of courage, *Sgt. Thomas F. Gaffney* turned a near rout into an attack. For his gallant action he was awarded the Silver Star Medal. In other heroic actions the following awards were made: Bronze Star Medal with "V" device, *M/Sgt. Frederick A. Neef.* Bronze star Medals, *Capt. Michael J. Lorenzo, Capt. Anthony J. De Angelis, Capt. Robert Masenga, 1st Lt. Stephen J. Borys, 1st Lt. Michael C. Fiorelli,* and *M/Sgt. Fred C. Carter.*

New Half-Size Walkie-Talkie

A new walkie-talkie, half the size and weight of its World War II counterpart, with double the range of communication was turned over to the Signal Corps recently by the Radio Corporation of America.

In addition to out-performing its predecessor in every way, the new walkie-talkie represents a marked advance in portability. Its transmitter-receiver unit is only 3 inches deep, 9½ inches high, 10½ inches wide, and it weighs only nine pounds. The entire equipment, including battery power supply, carrying harness, handset, two antennas, operating handbook, and spare parts, weighs only about 25 pounds .

Designed and built by RCA, working in collaboration with Signal Corps engineers, the new set is one of the first major items of military equipment to be disclosed by the electronics industry since the start of the conflict in Korea.

SC Radiac Set Chosen For Defense

A new type Signal Corps portable radiac set used in detecting and measuring the effects of atomic explosions, has been chosen as the official instrument to be used by federal and state civil defense teams.

The set, designated the AN/PDR-T-1, was developed and designed by the nucleonics branch of the Evans Signal Laboratory, Ft. Monmouth, N. J.

In choosing the set, preference was given by aspecial civil defense radiological committee to those sets which "can be readily maintained, and will perform satisfactorily under operating conditions which might be encountered in civil defense."

$55 Million SC Actions In Week

During a recent week when total Signal Corps procurement actions exceeded the $55 million mark, while the largest single contract for electronics-communications and related equipment was signed with Federal Telephone and Radio Corp.—$8 million for radio transmitting and receiving apparatus—seven individual agreements between the Signal Corps and Western Electric Co. boosted that company into the lead for the week with a total of $10,656,947 in newly-announced manufacturing obligations to supply equipment including radio sets, telephone terminal, carrier modulator and teletype units and maintenance apparatus. At the same time, with two other awards, the Federal Telephone and Radio Corp. total reached $8,686,327.

(*Continued on page* 64)

Cornell-Dubilier

(*Continued from page* 32)

was unusual in the design of a complete radio transmitter, receiver, source of power and associated equipment, so that it can be housed in the nose of a 3-or 5-inch high velocity artillery shell. Not only did extremely small radio components have to be developed, but they had to be able to withstand physical shocks and strains never before contemplated. Such forces were tremendous, since the acceleration in the gun barrel along the projectile axis was as high as 15,000 times gravity. In addition to this force, there was also the centrifugal force of the shell rotating due to the rifling in the gun barrel.

Of course, one of the most important components in any radio or television transmitter or receiver is the capacitor. Therefore, the success of modern means of communications as well as the innumerable other electronic devices which go to make up our present-day way of life, depended in no small way upon the successful development of capacitors. Cornell-Dubilier as the world's largest manufacturer of capacitors had an important part in developing such components and producing them in adequate quantities to fill both our war and peacetime requirements.

United Airlines

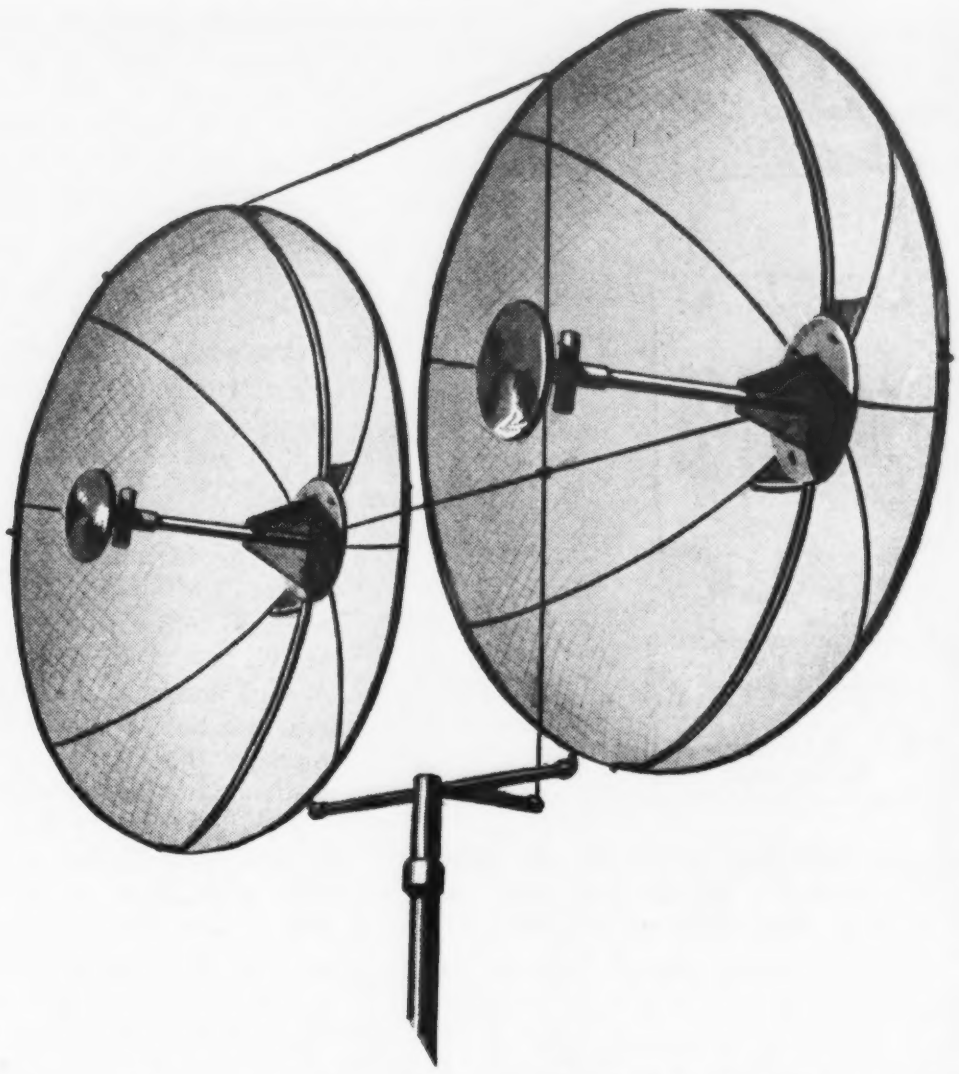
(*Continued from page* 20)

Of United's 71 scheduled stops, 35 are equipped with ILS. Also serving United's route are 130 LF/MF radio ranges and 27 "H" or radio beacon facilities.

United's interest in the development of new navigational and traffic control techniques always has been outstanding. The company in 1935, cooperating with Bendix Radio, developed an instrument landing system. Continued interest in this field is evidenced by recent participation in the development of "timed" approaches in the Chicago area where, last winter, aircraft were handled at the rate of a "take-off" and "landing" every three minutes for extended periods of time. Although this record is a vast improvement over previous radio range approach procedures which took approximately 15 minutes per aircraft, new techniques incorporated in the SC-31 Air Navigation and Traffic Control "Transition" program aim at "landings" at the rate of one each 1½ minutes on a given runway.

"Safety," a constant consideration of the industry, is receiving valuable assistance in the form of "Precision Approach" and "Surveillance" radars. Such installations are now in use at Washington, New York, Cleveland, Chicago, and Los Angeles airports. Automatic approach equipment is installed in United's C-54 fleet, relieving pilot personnel of the extreme precision required in the manual flying of the ILS. This latter feature, coupled with use of high intensity approach and runway lights and improved techniques in handling arriving and departing aircraft under instrument weather conditions, will serve to bring about a vast improvement in the reliability of air transportation.

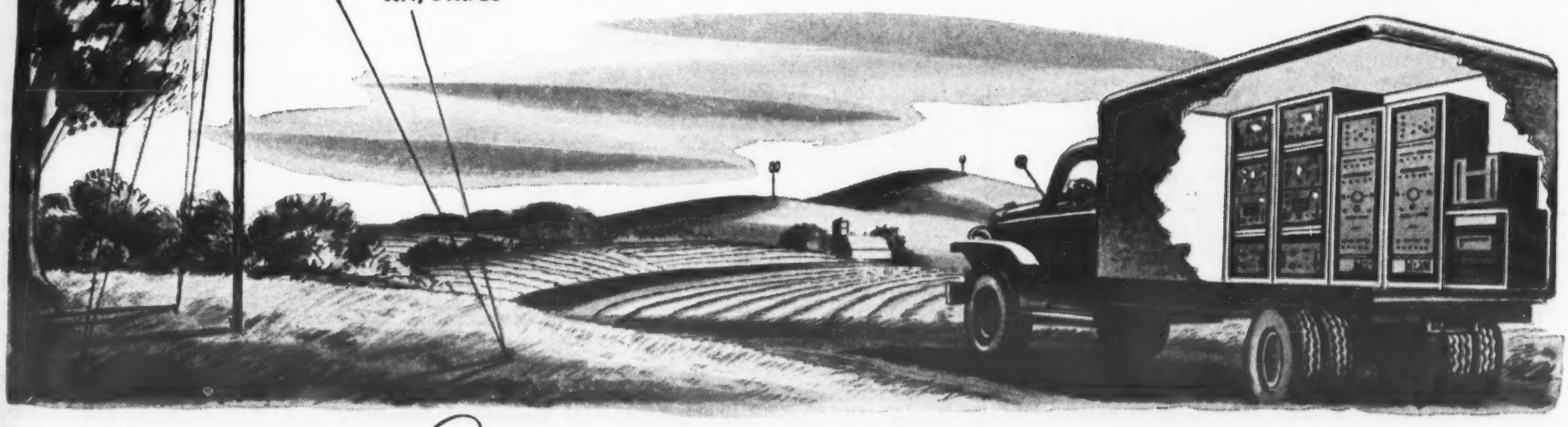
You can't cut a MICROWAVE!



As every signalman knows, no field problem can match —for headaches—the job of playing nursemaid to ground wire. Pounded by trucks and tanks, ripped by bulldozers, and shattered by artillery, signal cable is also target "A" for enemy patrols and saboteurs. Keeping tactical communications open has always been costly in manpower, materiel, and transportation.

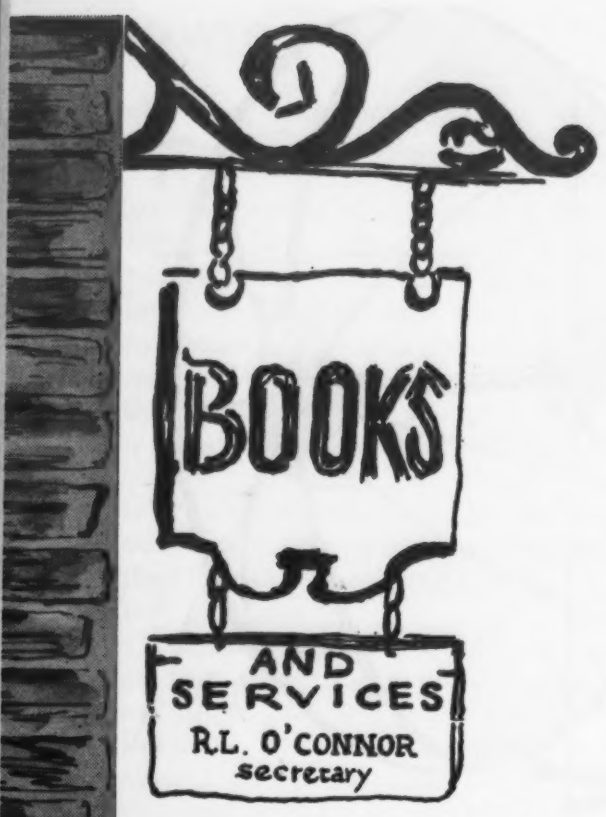
Working with Signal Corps engineers, General Electric has improved upon basic microwave designs to combine the best features of many. The new ANTRAC 26* is a radio transmitter—receiver and multiplex unit providing eight 2-way voice channels. Built for fixed or truck mounting, it is compact, durable, capable of operating in any weather, over any terrain. Designed as a connecting link in a communication network where laying wire is not feasible, this unit embodies the microwave point-to-point line-of-sight principle. It is one of many new military developments from Electronics Park where microwave systems are a specialty. Here, in the electronics capital of the world, General Electric's aim is to replace muscle with machinery—to make electronics provide us with a vital edge of superiority.

*AN/TRC-26



You can put your confidence in—

GENERAL ELECTRIC



WALK ON THE WATER. By Ralph Leveridge. Farrar, Straus and Young, Inc. 341 pages. $3.

This is a World War II story, in hard flat terms, of a representative squad of GI's doggedly intent on keeping alive through a nightmare of battle on a Pacific island.

The squad, a group of Americans thrown together by the haphazard events of war, are average men, their ordinary virtues and vices magnified and distorted by the tensions of armed conflict. We see them struggling to find some personal identity and comradeship in the face of the physical enemy in the jungle, and the psychic enemy within themselves.

In the most literal sense, this is not a pretty book, since it reflects the raw and primitive society of men in combat. Yet here is writing that everywhere deepens our understanding of human experience, and recreates the tragic essence of pity and terror, of courage and cowardice, in men forced to deal only with elemental conditions.

In *Walk on the Water*, Ralph Leveridge, a veteran of World War II, has written a first novel of exceptional interest and emotional power. There have been several good war novels recently, but this one seems to us an unusually bold and impressive work. It speaks plainly of plain events, of war as it is. And since we are at war again, it could well be a story of the present as well as the past.

WINE OF VIOLENCE. By Ralph Ingersoll. Farrar, Straus and Young, Inc. 274 pages. $3.

This is also a war novel, and also written by a "Ralph." But that is about all it has in common with *Walk on the Water* (see above).

The locale of this war story is far from the festering jungles of the South Pacific—the stage for its actors is, for the most part, wartime bomb-battered London, and Paris exulting in its deliverance from years of occupation.

There is something of Normandy beaches and Ardennes forest in the book. But mainly it is occupied with its principal character, Rowell Reardon, and his women.

TELEVISION AND FM ANTENNA GUIDE. By Edward M. Noll and Matthew Mandl. The Macmillan Company. 541 pages. $5.50.

You can find anything you want to know about VHF and UHF antennas and allied equipment in this comprehensive book. It presents heretofore unpublished facts on a number of new types of antennas as well as complete information on all standard types, and it gives definite procedures for determining accurately and quickly what type of antenna to use in a given location and how to place it, and for making sure that the receiver will get the most out of the antennas system.

The first part of the book provides a fundamental course in antenna theory. The principles of both simple and phased antennas systems, transmission lines, impedance matching, loss factors, and all other essentials are explained in clear, understandable terms.

The second part is a complete handbook on antennas and their installation. The characteristics, dimensions, advantages, and disadvantages of all types of antennas are given, including all commercial models, new types tested for special locations, UHF and indoor antennas, and rotating and multiple outlet systems.

Three handy charts on antenna dimensions, impedance, and gain provide a quick reference for obtaining correct dimensions for antenna elements or sections of line, or for comparative performance data.

Bradley's Book Ready in June

General of the Army Omar N. Bradley's book, *A Soldier's Story* — his personal account of World War II, from the final stages of the North African campaign to V-E Day — will be published on June 18th by Henry Holt and Company.

Besides his many anecdotes and stories about people and personalities, General Bradley reveals for the first time some of the discussions that lay behind top-level strategical and tactical decisions made either by telephone or in unrecorded private conversations during the war.

Often referred to as the "GI's General," General Bradley has been working on his book in whatever spare time he could find for several years. He dictated a million words of narration based on his experiences, much of which was later edited and rewritten to form the basis for the book. Primarily concerned with the vital field decisions that affected the outcome of World War II, Bradley nevertheless writes of his experiences with the same warmth and human understanding that earned him the affectionate regard of all who served under him.

The portion of the book now being serialized in *Life* will amount to less than one-eighth of the volume.

LEARN
RUSSIAN
IN 20 MINUTES A DAY
FRENCH • SPANISH
GERMAN — *easily with*
LINGUAPHONE
World's-Standard CONVERSATIONAL METHOD

Gain Power, Promotion, interesting job and armed services opportunities. LEARN AT HOME to speak any of 29 languages including the Oriental, by the proved LINGUAPHONE Method . . . quickly, easily, enjoyably. Made by noted language teachers; endorsed by educators; used in schools, colleges, armed services and by more than one million home-study students. Save time, work, money. Send for FREE book. 7 languages approved for VETERANS' training.

LINGUAPHONE INSTITUTE
168-03 Rockefeller Plaza New York 20, N. Y.

National Best Sellers

Compiled on a Percentage Basis from the reports of 64 Booksellers as listed in Publishers' Weekly for March 17, 1951.

FICTION

1.	Joy Street, *by Frances Parkinson Keyes*	$3.00
2.	The Disenchanted, *by Budd Schulberg*	$3.50
3.	River of the Sun, *by James Ramsey Ullman*	$3.50
4.	The Balance Wheel, *by Taylor Caldwell*	$3.50
5.	The Disappearance, *by Philip Wylie*	$3.50
6.	Foxfire, *by Anya Seton*	$3.00
7.	The Cardinal, *by Henry Morton Robinson*	$3.50
8.	Son of a Hundred Kings, *by Thomas B. Costain*	$3.00
9.	Rivers Parting, *by Shirley Barker*	$3.00
10.	Nightrunners of Bengal, *by John Masters*	$3.00

NON-FICTION

1.	Kon-Tiki, *by Thor Heyerdahl*	$4.00
2.	Look Younger, Live Longer, *by Gayelord Hauser*	$3.00
3.	Out of This World, *by Lowell Thomas, Jr.*	$3.75
4.	Boswell's London Journal	$5.00
5.	The Far Side of Paradise, *by Arthur Mizener*	$4.00
6.	Rommel the Desert Fox, *by Desmond Young*	$3.50
7.	The Decline and Fall of Practically Everybody, *by Will Cuppy*	$3.00
8.	The Riddle of MacArthur, *by John Gunther*	$2.75
9.	My Six Convicts, *by Donald Powell Wilson*	$3.50
10.	Thorndike-Barnhart Comprehensive Desk Dictionary, *ed. by Clarence L. Barnhart*	$3.75

Music's immortals play again, sing again, in RCA Victor's "Treasury of Immortal Performances"

A treasury of Music's Immortals

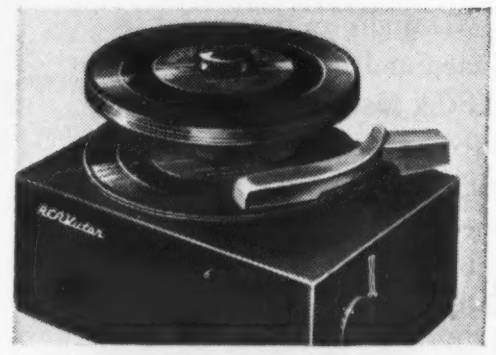
Now artists whose names are musical legend live again for the modern listener. You can hear them, at their finest, in RCA Victor's "Treasury of Immortal Performances."

In recreating these performances on both 33 and 45 rpm, acoustical engineers drew on a vault of master records guarded for posterity by RCA Victor. But new electronic techniques, developed through RCA research, give the new records a quality far surpassing that of the originals.

Because RCA Victor could draw on so vast a storehouse of the past, there is something in the "Treasury of Immortal Performances" for listeners of every age and taste. Caruso sings light and serious music—as do Schumann-Heink, Mary Garden, and others . . . Paderewski is here . . . and, if your taste is for popular music, such greats as Berigan, Armstrong, Waller, in rare early records.

* * *

See the latest wonders of radio, television, and electronics at RCA Exhibition Hall, 36 West 49th St., N. Y. Admission is free. Radio Corporation of America, RCA Building, Radio City, N. Y. 20, N. Y.



The magic of RCA Victor's "45" system—as an independent unit, or combined with radio or television receivers—has already led 55 record-makers to adopt it.

RADIO CORPORATION of AMERICA

World Leader in Radio — First in Television

NEWS

Reserve Lts. Wanted As Aviators

Signal Corps Reserve lieutenants are being asked to volunteer as Army aviators, the Department of the Army announced recently.

The aviators are needed to fly liaison type airplanes and helicopters which are used for a variety of Signal Corps jobs. These craft are used to carry messages, survey wire routes, supply remote signal installations such as mountain-top radio relay stations, lay field wire over terrain obstacles, and take aerial photographs.

Reserve lieutenants who are under 30 years of age, qualified for aviation duty, and who have had at least one year of active duty as officers are sought. Previous flying experience is desirable but not required.

Signalman, "Soldier of the Month"

"Soldier of the Month" at Fort Wadsworth, N. Y., for the month of February was Sgt. James Correia, Jr., a semi-automatic teletype-writer supervisor assigned to the 1267th ASU.

Sgt. Correia was congratulated on his achievement by Col. F. E. Kidwell, First Army Signal officer, who told him, "it is gratifying to me that a member of the Signal Corps can compete with and outscore soldiers of other branches of the Army. You have set a very fine example for the members of your organization to follow, and proven again that the service troops also can be soldiers."

Training Films On Radioisotopes

A series of training films on the use of radioisotopes is being prepared by the Signal Corps for the Armed Forces Institute of Pathology, with technical assistance from the Atomic Energy Commission.

Although the films are being produced for the training of scientific personnel in the various branches of the Armed Forces, they will be available also to qualified civilian educational and scientific groups.

Groups participating in the film project include the Signal Corps Photographic Center, the Atomic Energy Commission's Isotopes Division, the Oak Ridge Institute of Nuclear Studies, and the Oak Ridge National Laboratory. The Photographic Center will be responsible for producing the scenarios and producing the films. The other groups will be responsible for supplying technical guidance and arranging for necessary technical and scientific equipment and facilities.

Scientists and motion picture authorities connected with the series say it is the first time that it has been possible to cover a comparable scientific field in a single, complete, and coordinated film program.

Egan Chief of Management

Donald J. Egan was recently appointed chief of the management branch of the Signal Corps, the office charged with the efficient use of manpower, both military and civilian in Signal Corps installations throughout the country.

Kelleher to JC-EC Committee

John J. Kelleher, Jr. was recently designated Department of the Army representative from the Signal Corps on the frequency allocation panel, joint communications-electronics committee. He replaces Conrad P. Horne.

Insignia of the Association

AVAILABLE TO MEMBERS FROM THE SERVICE DEPARTMENT

The Association insignia in several beautiful designs and convenient styles authorized for wear by members is available at the prices quoted below. Order from AFCA Service Department, 1624 Eye St., N. W., Washington 6, D. C. The insignia is described as follows:

The central figure is an alert powerful American eagle with strong talons clutching lightning flashes—symbolic of a strong America and national defense—especially insofar as modern communications is concerned, our basic reason for existence. The border consists of leaves of the olive branch of peace, showing that the object of military preparedness in America is to assure a lasting peace. In the background are signal flags—the first means of signalling in sea and land warfare by United State forces. Just above the eagle and between his outstretched wings is a heavy bomber in flight, symbolizing the complicated and essential communications in the Air Force, and in Naval and Marine aviation. Above that is a radar antenna array, and at the very top a radio rely antenna—for the latest major step in military communications. And none of these could exist without industry—the foundation of AFCA. In the color version there are the traditinal colors of the signal flags—dexter white with red center and sinister red with white center—with a gold border to the whole.

Members should take every opportunity to display AFCA insignia. Worn on the uniform or civilian dress, or displayed on home or office wall, it carries with it an identification of distinction, is decorative, and helps to widen the scope of our Association by bringing it to the attention of others. Emblem is available in a variety of attractive forms.

ASSOCIATION MEDAL

Wrought on the medal in sharp and bold relief is the AFCA insignia. 1⅜ inches in diameter (shown at the right, actual size), the medal is suspended from a ribbon of heavy grosgrain silk in orange and dark blue. The medal is authorized for wear on the uniform as provided in A.R. 600-40, paragraph 68g and 70c (2) (dated 31 March 1944). Prices: $3 in bronze, $4 in silver, $5 in gold. Medal is not available for sale to student members.

LAPEL BUTTON FOR CIVILIAN WEAR

Bronze	$1.50 (including tax)
Sterling	2.50 (including tax)
10-K Gold	5.00 (including tax)

Specify whether signal flags should be in red and white enamel or plain.

MEMBERSHIP CERTIFICATES

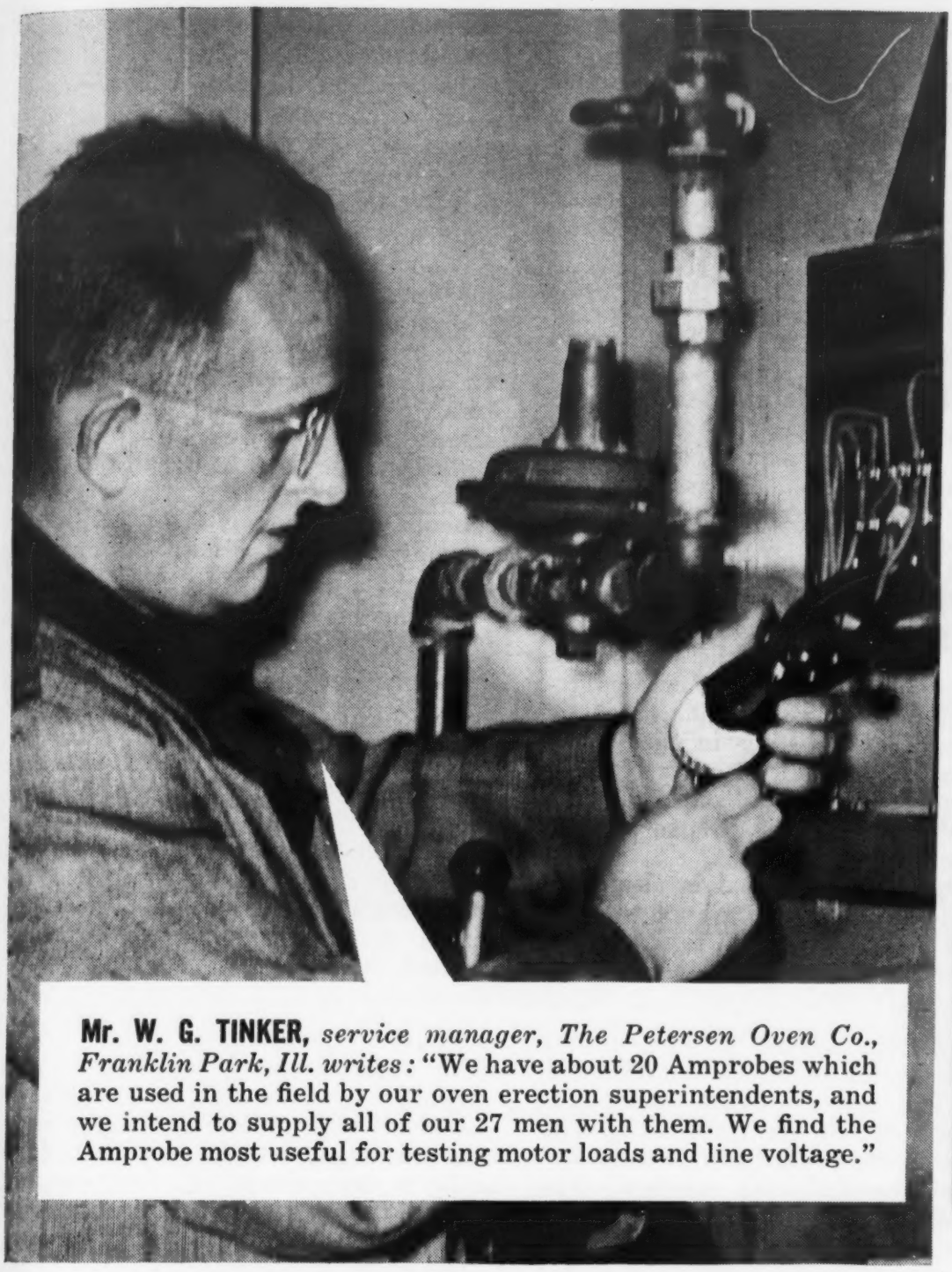
Printed on fine diploma paper with the Association emblem in full color and the member's name engrossed.
Price $1.50.

DECALCOMANIAS

Decalcomanias of the association insignia are now available from the service department. Three inches in diameter, in full color (eagle and wreath in bronze, red and white signal flags, against a silver-gray background) these decals can be transferred from either side to glass, or any other smooth solid surface, so that they will appear to be painted on that surface.

Price—4 for $1.

Our Book Department can furnish any book currently in print. We will also help to secure older titles that you may need to complete your library. A 10% discount is allowed all Association members on orders of $10.00 or more. Please indicate author and publisher where known, and allow three weeks for procurement and delivery.



Mr. W. G. TINKER, *service manager, The Petersen Oven Co., Franklin Park, Ill. writes:* "We have about 20 Amprobes which are used in the field by our oven erection superintendents, and we intend to supply all of our 27 men with them. We find the Amprobe most useful for testing motor loads and line voltage."

NEW HIP-POCKET TOOL SAVES COSTLY HOURS

for maintenance and service crews

complete with genuine top grain cowhide leather case and voltage test leads

Here's what your men can do with this one pocket-size tool:

Determine load conditions instantly without having to shut down equipment or break insulation of conductor, spot motor overloads, diagnose trouble calls faster under actual load, check line voltage and drops, set overload relays, load balancing, etc. Worth its weight in gold to your field engineers, service crews and plant maintenance men—because it *can be taken along on every call they make.* If you have an unusual requirement, we may be able to design an Amprobe model with special ranges for you. *Model A-6, illustrated, measures 5 A.C. current ranges and 2 A.C. voltage ranges: 0/10/-25/50/100/250 amps., 0/150/600 volts. Two other popular models also available.*

Write for Technical Bulletin. Pyramid Instrument Corporation, 49 Howard Street, New York 13, N. Y.

OTHER AMPROBE USERS SAY:

"Saves lots of time, and that's important to a service man that has to make from 10 to 20 calls a day." *— J. W. Poston, Davidson & Lovelace, Florence, Ala.*

"Could a doctor get along without a stethoscope? We find as many occasions to use our Amprobes as we do our pressure gauges — and in refrigeration, that's saying plenty!" *— J. E. Schilling, Schilling Chilling Co., Indianapolis, Ind.*

"Very handy for quick check on motor loads without any shut-down time". *— E. J. Wynne, Foreman, Walter Baker Div., General Foods, Dorchester, Mass.*

AMPROBE®

the only pocket-size snap-on volt-ammeter

Pfc Olemaun of Sig. Corps

(*Continued from page* 21)

faulty flashlight instead of jarring the flashlight with his hand, those who knew Nate also knew he was indeed in a happy fog.

Annually, Nate and his brother-in-law finance a whaling expedition, and Nate takes his annual leave to join the hunt. Last year, two whales were taken, representing an excellent year, and also calling for two "Nalukatuks."

Nalukatuk is the Eskimo Thanksgiving and each whale taken on the hunt calls for one day of celebration. The victorious whaling crew presides over the celebrating of the Nalukatuk.

Nalukatuk starts slowly. It begins early in the afternoon when preparations have been made, such as canvas windbreaks, and a blanket stretched for the blanket toss. The blanket is made of Ogrook hide. (Ogrook is the bearded seal.) It is possibly 10 feet in diameter, cut with hand holds every inch around it. The blanket is stretched and ropes are tightened until it is taut, about 5 feet above the ground. Later in the afternoon people begin to gather. Some jumping starts, mainly among the youngsters. As the night moves in, the blanket toss gathers momentum. Men and women join wholeheartedly in the sport, and everyone who can get a handhold on the blanket joins in the toss. The contestant clambers upon the blanket and starts jumping while the populace tosses the blanket until the contestant either sails over their heads into the sand, into the crowd, or lands on his dignity.

Sgt. Royal M. Donelson, Acting Opererator-in-Charge at Barrow during the last Nalukatuk, reports that he personally witnessed Nate being tossed 15 feet in the air, time and again before the inevitable happened. After the blanket tossing the drummers start and the dancing begins. The feasting and dancing usually lasts until the wee hours of morning.

Pfc. Olemaun was originally hired as a civilian worker by the ACS to perform general utility work around the station. In 1945 when the number of civilians allocated to Barrow was reduced, Nate, after considering the many advantages of enlisting in the Army, as compared to work at other types of employment available, decided that the Alaska Communication System was the most promising.

Having been interested in electricity before joining the ACS, Nate has hopes of working his way up in rank, as well as increasing his knowledge of electricity. His main duty at present is maintenance of the diesel generator units which supply the ACS power at Barrow. His other duties include messenger service, minor repair work on the station weasel (snowmobile), occasional teleprinter operation, carpentry work and general heavy utilities work around the station. In addition, his is the task of repairing antennas when broken or damaged by high winds. Last year it was necessary to make repairs on the main antenna when the temperature was a mere 40 below zero with a strong wind blowing, weather that would discourage almost anyone else. Climbing and working atop a 90-foot antenna pole under these conditions are only "run of the mill" assignments for Nate.

During his spare time, if you could conceive that any is available, Nate is learning radio code and typing, and soon he will be able to take over the duties of a full-fledged radio operator.

Pfc. Nate Olemaun, like all members of the ACS, is proud of his part in the history and development of this organization which is continuously prepared to furnish competent and technical communication service during peace time, or in the defense of Alaska and the United States.

Time Signals

(*Continued from page* 28)

checked by reference to the astronomical observations, and their errors and rates are detemined. During periods of a few days the variation in the daily rates of these clocks does not ordinarily exceed one thousandth of a second. Corrections may be made to these clocks in increments of 1/1000 second by rotating the synchronous motor stator.

Time Signals

Time signals, based on Naval Observatory time determinations, are sent out by the stations listed below:

NSS —U.S. Naval Radio Station, Annapolis, Maryland
NPG —U.S. Naval Radio Station, Mare Island, California
NPM —U.S. Naval Radio Station, Pearl Harbor, Territory of Hawaii
NBA —U.S. Naval Radio Station, Balboa, Canal Zone
WWV —Standard Frequency Station of National Bureau of Standards, Beltsville, Maryland
WWVH—Standard Frequency Station of National Bureau of Standards, Maui, Territory of Hawaii

The naval radio stations transmit time signals during the last five minutes of certain hours as shown by the schedule. Signals (dashes) are transmitted on each second of the five-minute period, except that no signals are sent on the 29th second of any minute or on certain seconds at the ends of the minutes, as shown by the following table. The dashes indicate the seconds on which signals are transmitted. The seconds marked "60" are the zero seconds of the following minutes. The signal at the end of the 5-minute period, i.e. on the beginning of the hour (shown as 59 minutes 60 seconds below) is much longer than the others. In all cases the beginning of each dash indicates the beginning of a second. The ends of the dashes are without significance. Signals are transmitted on all the seconds not shown below (1 to 49, inclusive) except that there is no signal on the 29th second of any minute, as stated above.

The time signals transmitted from NSS, the Naval Radio Station at Annapolis, Md., are controlled directly from the observatory by land line. Time signals from NSS have an average error of less than .01 of a second. The other naval radio stations relay the time signals from NSS. The relayed time signals are correct to about five-tenths of a second.

A project is now underway to provide the naval radio stations with AN/FSM-5 crystal clocks of their own. When these are provided, each station will transmit its own time signals. These will be monitored by the observatory and the radio stations will be informed of errors.

The observatory monitors the time signals transmitted by the Bureau of Standards and reports errors in these signals.

Stations WWV and WWHV transmit standard frequencies and superimposed time signals using several carrier frequencies as listed below. The transmissions are made with modulated waves and may therefore be heard with ordinary radiophone receivers. A pulse 0.005 second in duration is transmitted on every second, except the 59th second of each minute. These pulses consist of five cycles of a 1000-cycle audio note, and are heard as clicks when listening to the broadcast. They are superimposed on an audio frequency. At precisely one minute before the hour and at every multiple of five minutes thereafter, the audio frequency is interrupted for an interval of exactly one minute, for the purpose of making announcements. The time when the audio tone will be resumed is transmitted in International Morse Code, using four digits on the twenty-four hour system, and starting with 0000 at Oh GMT. The first two digits give the hour and the last two give the minutes. Station WWV also makes a voice announcement of the hour and minutes in Eastern Standard Time. The time-signal beats continue during the interruptions.

Station WWV transmits time signals continually day and night. Station WWVH is interrupted for periods of approximately four minutes immediately after each hour and half hour, and for periods of approximately forty minutes beginning at 0700 and 1900 GMT. During the first four minutes of each hour a modulated frequency of 600 cycles per second is transmitted. This is followed by a transmission of 440 cycles during the fifth to the ninth minute. These frequencies continue to alternate during the remainder of the hour.

At REMOTE TRAINING BASES or OVERSEAS . . . here's a dependable link with HOME!

Regular Price $49.50

hallicrafters

. . . international long-range *Precision Radio*

S-38B

You can buy it in your Post Exchange, Hallicrafters famous S-38B. Covers broadcast band and three short-wave bands . . . brings in remote U. S. stations and reception from all over the world.

Precision-built by Hallicrafters—it is all radio! It is functionally-designed by Raymond Loewy, in steel cabinet; AC-DC.

COMPANY OFFICERS find this radio a sound investment for unit funds, because it serves *all personnel* with fine radio reception no matter where your location. No frills . . . just the finest radio built!

SPECIAL MILITARY PRICES
at PX's and Ship's Stores throughout the U. S. Armed Forces

Overseas Favorite S-72L long-range portable

S-72L

Here's the one pal every officer and enlisted man wants to take along to overseas assignment—a precision radio that really tunes in the stations back home. Powerful 8-tube set, plus rectifier. AC-DC or batteries. Built-in loop antenna for standard reception, plus 61-inch collapsible whip antenna for short-wave reception. Input jack for headphones, and space inside for power cord and headphones.

Regular Price of S-72L (less batteries) $119.95

Ask your PX Officer or write to Dept. S
Special Military Representatives listed below.

East Coast
GEORGE E. ABBOTT & CO.
756 Fourth Avenue
Brooklyn 32, New York

West Coast
FOLEY-WILLIAMS CO.
537 W. Broadway
Long Beach 2, California

WORLD'S LEADING MANUFACTURER OF *PRECISION* RADIO & TELEVISION • CHICAGO 24, ILLINOIS

Time Signals

WWV	*WWVH*
Radio Frequency	*Radio Frequency*
10,000	10,000
2,500 kc	
5,000	5,000 kc
15,000	15,000
20,000	
25,000	
30,000	
35,000	

The observatory has no special agreement with any telegraph company, but furnishes time signals free to all firms and individuals who provide wires for the purpose. A radio station may tune in on the time signals and rebroadcast them.

Western Union has a direct wire connection with the observatory and transmits time signals for a period of three minutes before noon, Eastern Standard Time, each day to its offices throughout the country. These time beats use the observatory's code, which omits a beat at the 29th second and follows an identifying pattern during the last ten seconds of each minute. As many as 100,000 customers, including business houses, depots, radio stations and schools, receive Naval Obervatory time via Western nUion.

Errors of Signals

During the transmission of time signals the Naval Observatory determines the tme of reception with respect to one of the crystal-controlled clocks. This is done by means of a device employing a strobotron tube. The correction to the clock is subsequently recomputed using star observations both before and after the signal. The average error of the time signals, are sent on 122 kilocycles, is a little less than one hundredth of a second. However, there are many scientific and technical uses of the time signals which require accuracy of a higher degree. In order to meet the requirements of such work, the Naval Observatory distributes time signal correction sheets without charge to those who request them. These sheets give the times of the signals, as actually received by radio at the Naval Observatory. Ordinarily these sheets cover all time signals sent from stations NSS, WWV, and as many as possible from other radio stations, including some foreign stations.

For work of highest precision, time transmissions by stations NSS and WWV are to be preferred over those transmitted by other stations.

Use of Time Signals

The Naval Observatory time signals were first sent out in order that navigators might check their chronometers before leaving harbor. They have since become the basis of the standard time used in the United States, and are employed generally by navigators at sea in checking chronometers. Many special uses of the signals have arisen. These include longitude determinations for precise surveying and map-making, and gravity determination by means of which minerals and oil are located. Radio monitoring stations use the signals in checking the frequencies of transmitting stations, while seismologists use them in co-ordinating earthquake records.

The American Geophysical Union, at its 31st Annual Meeting in May 1950, adopted the following resolution:

"*Whereas*, There is a vital need in all seismological work for accurate time service, and

"*Whereas*, The time service maintained by the United States Naval Observatory, the Naval Communications Service, and the National Bureau of Standards has been of great use in this work, therefore be it

"*Resolved*, That the American Geophysical Union express its appreciation of the valuable scientific cooperation and reiterate its desire for the complete continuance of this time signal service, and be it further

"*Resolved*, That copies of this resolution be sent to the Secretary of the Navy, the Director of Naval Communications, The Superintendent of the Naval Observatory, the Secretary of Commerce and the Director of the National Bureau of Standards."

Since time is one of the dimensions of the physical universe ,it is obvious that an accurate knowledge of time is generally necessary to the investigation of physical problems. The Naval Observatory is lending aid to the meeting of many of these needs, and at the same time is continuing to supply time for navigation and commerce.

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